WALL STREET GOLD MILL
Joshua Tree National Monument
Twentynine Palms Vicinity
San Bernardino County
California

HAER No. CA-110

PHOTOGRAPHS

REDUCED COPIES OF MEASURED DRAWINGS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
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HISTORIC AMERICAN ENGINEERING RECORD

WALL STREET GOLD MILL
Joshua Tree National Monument

HAER CA-110

LOCATION:	8-1/4 miles south by southwest of Twentynine Palms, San Bernardino County, California UTM: 11.580050.3766300 Quad: Indian Cove, 7.5 minute series Twentynine Palms, 15 minute series
DATE OF CONSTRUCTION:	1931
PRESENT OWNER:	Joshua Tree National Monument National Park Service Department of the Interior
PRESENT USE:	Presently in disuse. There are occasional interpretive tours of the site.
SIGNIFICANCE:	The Wall Street Gold Mill is the only complete and virtually operable stamp mill in the region. Although this vernacular facility's two-stamp size is atypically small, its technology represents the classic California stamp mill.
PROJECT INFORMATION:	This recording project is part of the Historic American Engineering Record (HAER), a long-range program to document historically significant engineering and industrial works in the United States. The HAER program is administered by the National Park Service (NPS), U.S. Department of the Interior. The Wall Street Gold Mill Recording Project was cosponsored during the summer of 1991 by the Historic American Buildings Survey/Historic American Engineering Record, Joshua Tree National Monument, and Park Historic Preservation, Western Regional Office, NPS. Elizabeth (Lysa) Wegman-French, HAER Historian

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ABSTRACT

The Wall Street Gold Mill is the only mill in the Joshua Tree/Twentynine Palms region which is virtually complete and potentially operable. Its obsolete technology represents a classic California stamp mill. Because of these two factors, the mill is on the National Register of Historic Places. The two-stamp mill used amalgamation and concentration to remove gold from hard-rock ore. Features on the site include the mill machinery, the building which houses it, the well which supplied water for the mill's operation, and the well pump. A bunkhouse has been demolished. William F. (Bill) Keys, long-time desert resident and small mine operator, opened the mill in 1931. It is south of Twentynine Palms, California, in the Mojave Desert. Joshua Tree National Monument was established in 1936, but the mill was excluded from it. It became part of the monument in 1971, after Keys' death.

In an area where water is more valuable than gold, the well was the site's original attraction. It was dug in the 1890's, apparently by Bill McHaney, and was used to water cattle and to mill ore in an arrastra for about sixteen years. Oran Booth and Earl McInnes rediscovered the well in 1928.

During the Depression, mining regions experienced a second gold rush. As prospectors arrived, Keys observed the need for a mill, and filed a mill site claim on the five-acre parcel in 1930. A mill was constructed south of the current site in 1930. The following year, Keys and two associates built the mill at the present location. The Wall Street Mill consisted of a conglomeration of equipment which Keys assembled from mines and mills in the area. He also added equipment after he opened the plant. As a result, the machinery at Wall Street dates from circa 1891 to the 1930s.

Keys operated the plant primarily as a custom mill, processing ore for other miners for a fee, while also handling ore from his own mines. The relatively modest size of the two-stamp mill was nevertheless appropriate for the small-mine operators of the region. Keys worked the mill intermittently until 1942. His son, Willis, operated it in 1949, and Keys again ran the plant for about a month in 1966. The Wall Street Mill has been closed since that time.

Heavy timber framing supports the ore chute, ore crusher, and the two-stamp mill. The vernacular construction that surrounds this heavy timber core is an eclectic range of wood framing members and corrugated sheet metal. Deck floors are wood planking and floors on grade are dirt. The machinery and equipment include a

grizzly, a jaw crusher from the Fulton Engine Works, a two-stamp mill built by the Baker Iron Works in 1891, an amalgamation table, a Myer concentration table, two large galvanized-iron water tanks, a reciprocating water pump, a three-horsepower Fairbanks-Morse engine which operated the pump, and a twelve-horsepower Western gasoline engine. The latter engine powered the mill machines through a system of shafts, belts and pulleys.

Location

The Wall Street Mill is located about 140 miles east of Los Angeles, in Joshua Tree National Monument. There are two access roads to the site: one from the west/northwest via the town of Joshua Tree, and the other from the east via the main monument road from Twentynine Palms. The parking lot is near Hidden Valley campground; the mill is reached by walking twenty minutes on an unmarked trail up a dry wash.

The southern edge of the Mojave desert provides the setting for the site. However, an elevation of about 4,500' helps modify the extreme desert heat. The temperatures on summer days are often in the 90s, and readings of over 100 degrees are common. Summer nights and winters are cooler. Joshua trees, Mojave yuccas, creosote bushes, and other small desert shrubs are scattered across the site and the adjacent Queen Valley, which stretches to the south. The mill is nestled at the base of giant boulders which form the southern edge of an area known as the "Wonderland of Rocks." The site is in the southwest quarter of Section 34, Township 1 South, Range 8 East in San Bernardino County, California, only about 1,000' north of the boundary with Riverside County. The perimeters of the site placed on the National Register of Historic Places form a rectangle with corners located on the following Universal Transverse Mercator points: 11/580155/3766405, 11/580160/3766205, 11/579900/3766200, and 11/579895/3766400.[1]

MINING IN THE DESERT

The major mining area in Southern California was in the Mojave and Colorado desert region east of the coastal mountains. Today much of this area is in Joshua Tree and Death Valley National Monuments. The geological formations here are completely different from those found in the central and northern parts of the state. There are no continuous mineral belts of any substantial distance; instead the minerals tend to occur in broken segments and pockets. In addition, the environmental

conditions of the region are challenging: it is a forbidding area of dry sandy basins separated by many low ranges of mountains beset by intense heat, scarce water, and little wood. The terrain made transportation of materials arduous and expensive. In 1899 a mining publication described the northern area as "the terrible Death Valley country ... where, when the water gave out or the way was lost, or sandstorm came, hundreds have died deaths of agony and added white bones to the scant debris of the desert."[2] Even so, the lure of gold brought prospectors willing to gamble on winning. Mines were scattered all over the region in numerous mining districts.

Euro-Americans had entered the Joshua Tree National Monument region in the 1870s and 1880s to mine and graze cattle. There was a flurry of mining activity in the Twentynine Palms district from about 1873 to 1883. The area was most productive in the 1890s and early 1900s, but did experience another surge of activity in the 1930s.[3]

The Great Depression

In the 1920s and 1930s, when the rest of the country was undergoing the excitement, trials and tribulations of progress in the modern era, the monument area seemed "stuck in time." Life in the desert resembled an earlier age due to transportation and communication difficulties, the resulting isolation of the few scattered residents, and the lack of conveniences. The roads were rough dirt tracks, there was no telephone service or electricity (and therefore no refrigeration), and it took at least ten days to receive mail. Native Americans, cattlemen, miners and prospectors frequented the area. The desert environment was all-encompassing and unforgiving; one had to learn to deal with it in order to survive. The keys were adaptability, self-sufficiency, flexibility, and resourcefulness.

Gold production in the West slumped after World War I and stayed low for the next decade. Low gold prices and high operating costs discouraged mining activity. The beginning of the Depression in 1929, however, marked the start of a new phase in the history of California gold mining. Up to 15,000 desperate, unemployed people flocked to gold-bearing areas in the early years of the Depression, hoping to make a living panning, rocking, sluicing or mining the valuable metal. Their numbers increased after 1933, when the price of gold began rising. Up to that time, the federally established price of gold was $20.67. In August 1933, the U.S. government gave permission to Americans to sell their gold at the world's open-market price, which ranged from $29.25 to over $35 per ounce that year. Then on January 31, 1934, a presidential proclamation set the official mint price of

gold at $35 an ounce. This high, stable price enticed even more amateur miners, with little capital or experience, into the role of gold diggers. Many reworked old quartz mines, prospects and dumps. The earnings were meager--the return averaged less than 50 cents a day per person. Even so, gold production increased between 1929 and 1940, especially after gold was revalued.[4]

This twentieth-century gold rush swept across the future monument area. Individual prospectors were attracted to the upper valleys of the western third of the monument (Pinon Mining District), which contained pockets of gold. Large operators and investors gravitated towards the eastern section (Gold Park and Dale Districts), where gold occurred in more extensive deposits. The Twentynine Palms newspaper estimated in the fall of 1932 that there were thirteen mills operating in the area, over 100 men working in at least as many mines, and 100 more men prospecting. Willis Keys observed later that "the area was sort of booming when it was supposed to be hard times."[5]

Then on August 10, 1936, Presidential Proclamation No. 2193 set aside 1,290 square miles in Riverside and San Bernardino Counties as Joshua Tree National Monument. The proclamation recognized valid existing mineral claims and did not obstruct continued operations on these properties. The new status did, however, prevent the location of any new mining claims, forcing active prospecting to stop.[6]

In March 1937 there were still forty groups of mining claims (150 locations) being actively developed in the monument. Most of the ore on these properties had been discovered and developed since 1932.[7] Several mills were in operation in 1937; their daily processing capacity ranged from two to sixty tons. The great majority of the mining activity in the monument took place in the eastern two-thirds, and that is where most of the 250 people employed in the mines and mills worked.[8]

Individuals in the western section (Pinon Mining District) worked their claims by hand, taking perhaps a month or more to remove ten to twenty-five tons of ore. But the ore was usually worth at least $20 per ton, which gave them enough to eat.[9] These mines were too small to have their own mills, so the men hauled their small quantities of ore to custom mills to have the gold extracted. The Sullivan and Michels Mills in Twentynine Palms did custom milling, as did some of the larger mills that were attached to mines, such as the New Eldorado.[10] Bill Keys' Wall Street Mill was situated in the western section, primarily servicing the individual, small-scale miners. This two-stamp mill was smaller than typical mills, yet it was larger and more expensive than most small-mine operators use or afford.

HISTORY OF THE WALL STREET MILL SITE

Early History

Native Americans migrated through the locale, and rock art and other evidence has been found not far from the mill site. The two tribes in the region made seasonal forays for hunting and gathering. The Chemehuevi tribe (closely related to the Southern Paiutes) were forced into the desert from the Colorado River area in the southeast, and a small group reached as far as the oasis at Twentynine Palms. The Serranos, also hunter-gatherers, occupied the immediate area around Twentynine Palms. There is evidence that they used the northern and western region of the national monument for food collecting and processing, hunting, and possibly religious activities.[11]

The early Euro-American history of the mill site is largely undocumented, and is known only through oral tradition. Most accounts credit local cattleman and miner William (Bill) McHaney as being the first caucasian associated with the site. He arrived in the region in 1879, and learned about the location of water, trails and gold deposits from the Native Americans. It is commonly believed that McHaney, along with his brother Jim and several other gang members, were cattle rustlers. They apparently "acquired" livestock in other areas, brought them to the isolated desert to range for a while, then sold the cattle. They used an area known as the "cow camp" (now on Keys' Desert Queen Ranch), as their headquarters. Water was critical to their livestock business, so they would have always been on the lookout for indications of a source. Some mesquite trees near the current mill site may have tipped off McHaney that there was water there. In the summer of 1896, he hand-dug a well 30-40' deep and used it to water his cattle. He camped there until 1898, but did little else to change the site.[12]

Some people speculate that this original well is not the same as the current one. It has been suggested that a depression in a clump of trees 70' northeast of the existing well marks the spot of the older hole. However, others maintain that there was only one well. Oran Booth, who later cleaned out the current well, observed that it was drilled and blasted through solid granite. There was no air equipment for mining in the region at the turn of the century, so the digger must have used a hand drill and single jack. "Now, I tell you, that well was a lot of work to dig. I don't think a person would want to dig another one if he already had one," Booth reasoned.[13] The depression in question is in an area that is sandy on the surface, so it is possible that a hole was sunk there because it was an easier place to dig,

but one in which the sides kept collapsing. The depression was later used as a trash site, probably in the 1930s.

George Meyers, one of the McHaneys' gang members, took over the site at an unknown date after William McHaney had abandoned it, using the well for his own cattle. Meyers reportedly left in the summer of 1900; however, he may have left earlier because a Mr. Tulley posted a location notice on the site in 1898.[14] Tulley had been a minister in Colton (about eighty miles west). He built an arrastra on the site, and crushed ore from the Tulley Mine for the next three to five years.[15] This marked the first use of the site as a mill. Gold in this region was found enclosed in rock, which had to be crushed to release the precious metal. An arrastra was a simple gold mill, which an individual could build of native materials. It was circular, with a bed of flat stones and a low wall around the circumference. One or more cross beams pivoted from a center post, and extended to the perimeter. Stones were attached to the beam and were dragged around the circle, crushing the ore. These mills could be powered with animals or engines, or even people.

About 1905 or 1906, Joe Reynolds began using the water from the well for his cattle, which he grazed there until the fall of 1911, making no improvements to the site. Reynolds apparently left the site at about the same time that he met a cowboy named Bill Keys.[16]

Apparently, a Mr. Duncan later posted a location notice on the land, but he was on the site for only a few days before two Riverside lawyers evicted him.[17] It is not clear why they did this, or if their actions were legal. If no one had an active claim on the site, then Duncan should have been able to claim it himself.

The owners of the Gold Tiger Mine, Bill Thornton and U.C. Wirtz, next took over the property with the intentions of milling ore. However, they stayed only for a short time, and moved away in the latter part of 1911 or 1912. Up to this point, no one had filed a claim on the site with the county government, so technically no one had the rights to the land. The site was idle from 1912 to 1928.[18]

Rediscovery of the Well

In the spring of 1928, after working a year in the Los Angeles area, Oran Booth became disenchanted with being a junior high school teacher, but was undecided on what direction his career should take. Early that summer, he ran into an old acquaintance, Earl E. McInnes, a promoter with a likeable personality ("that's

the only thing they have to sell," Booth noted later). McInnes was excited because he had a gold mine in the desert that was going to make him a fortune, and if Booth joined him in the venture they would both soon be rich. Booth had grown up in a mining area of northern California and had spent summers with an uncle who had a mine. The lure of the gold was strong and he agreed to join McInnes. Booth purchased some necessary equipment: a Ford model-T truck with a hoist, a couple of engines, chemicals, and other supplies. He loaded a trailer behind his Cole 8 car, and the pair drove east into the desert. After arriving at the mine, Booth examined the tailings from the 20' shaft, quickly realizing that there was nothing worthwhile to obtain from it. McInnes insisted the mine was rich in gold, silver, and lead, but when Booth sent a sample to an assayer in Los Angeles it proved to be worthless. Instead of heading home, however, Booth decided to spend some time prospecting.[19]

Later that summer, around early August, Booth found a post about 2' high, with granite rocks around it, which he recognized as an arrastra. (He later found Tulley's 1898 location notice inside a can in an inconspicuous pile of rocks about 50 yards to the east.) Booth also realized that there had to be water in the area because the arrastra needed the liquid to operate. The partners found a hole nearby, which had filled with dirt to within 5' of the surface. Digging out the hole required a windlass and some rope, which they borrowed from a man named Bill Keys, who lived nearby. Booth shoveled dirt from the hole into a bucket made from a fifteen-gallon drum. McInnes stayed on top and hoisted out the filled bucket. Booth knew he had reached the bottom, 32' below the surface, when he hit a flat rock about 3' square that was as "clean as a dish." There was a crevice across the side with an opening that allowed water to enter. The precious liquid soon filled the well. The partners built a collar platform around the mouth of the well and set up a pulley to hoist up water.[20]

Booth and McInnes posted a location notice for a 460 square-foot mill site (4.85 acres) on November 28, 1928, and recorded it on May 9, 1929. McInnes, ever the promoter, called it the Wall Street Mill because "it sounded like a lot of money." They did not have any intention of building a mill, thinking that water was more valuable than gold in the region.[21]

Building a cabin was the next order of business. They purchased the lumber in San Bernardino, about eighty miles west, and pulled it up into the high desert in the trailer behind Booth's car. The men began construction on a one-room cabin measuring 10' x 14', located about 30-40' north of the well. Booth left for Hollywood to obtain additional employment before the cabin was completed; he had spent all of his money. Before long, Booth and

McInnes had a falling-out. McInnes abandoned the well and Booth decided not to return, giving both the site and equipment to his new friend, Bill Keys.[22] Keys refused the offer, however, and instead volunteered to hold Booth's equipment at his ranch in case he decided to return in the future. Booth resisted, but eventually agreed, though he had no intention of coming back to the region.

Bill Keys

Bill Keys was 15-years-old when he succumbed to the urge to move west. He was born September 27, 1879, and grew up in Nebraska. After leaving his family's home, he spent the next few years roaming the West doing odd jobs, working with cattle, serving as deputy sheriff, and mining. Keys was working as a cowboy when he came into the Twentynine Palms area around 1910, meeting Joe Reynolds, who invited him to work in the spring roundup. After that event, Keys leased Reynolds' Crown Prince Mine.[23]

In 1911 he bought an interest in the Desert Queen Mine, which eventually became one of the most successful and longest worked mines in the area of Joshua Tree National Monument. When the estate of the deceased owner was unable to pay him for back wages, Keys filed a claim on the mine and thus acquired full ownership of the Desert Queen in 1917. He never became rich from the mine, however, preferring to lease it to others and appropriating their equipment when they left.

Keys began to acquire land through homesteading in 1916; this formed the basis of his Desert Queen Ranch, about four miles west by road from the Wall Street site. By 1943 he had 800 acres in Riverside and San Bernardino counties.[24] He married Frances Lawton in 1918; they had five children, three of whom they raised to adulthood on the ranch. Their family was self-sufficient, and one of the very few which was able to make a living in the desert. The Keys developed ingenious methods of adapting to the environment, including watering methods for vegetables, fruits, and livestock. Keys himself also acquired numerous skills which increased their self-sufficiency. Besides operating the mill, he worked as a miner, assayer, blacksmith, cattle rancher, gardener, carpenter, mechanic and stonemason, in addition to knowing remedies for illnesses. He was always busy and continually formulated new plans, be it building a dam, planting an orchard, or clearing a road.

Keys commonly recycled, salvaged, repaired, adapted and reused all types of materials and equipment. He also established a social and economic network which supported this pattern. He encouraged people to mine in the area, helped them all he could,

observed their predictable failures, and appropriated control of their site and equipment after they abandoned their site. He distributed the leftovers of their mining attempts to sites that he was working, or hauled the refuse to his ranch. There he carefully organized the extravaganza of beds, vehicles, stoves, and equipment for brick making, farming and mining.

A dark reputation followed Keys, and most people who did not know him were afraid of him. The source of the rumors apparently relates to an ongoing conflict he had with a San Bernardino sheriff who had grazed cattle in the area homesteaded by Keys. However, numerous interviews with acquaintances of Keys stated that although most were initially apprehensive about meeting him, they soon realized that he was a kind, fair, and gentle man who frequently helped others, and took good care of his children. These people uniformly came to have high respect for Bill Keys.[25]

The Construction of the Wall Street Mill

Early in 1930, Oran Booth returned to the area, prospecting in the Sheep Hole Mountains, about thirty miles northeast of the Wall Street site. On the way there he stopped to visit with Keys for a few minutes; he did not leave the ranch again for two years. Keys kept Booth busy with various projects at the ranch, primarily repairing the many machines in his possession in return for equipment and material. Keys, surprisingly, was not an adept mechanic. Booth, who had previously taught junior high classes in Los Angeles, also agreed to act as school teacher for Keys' three children. After Booth confirmed his lack of interest in continuing work at the Wall Street Mill, Keys and his wife, Frances, claimed the 660' x 330', five-acre site on July 1, 1930, and recorded their notice on July 9.[26]

Keys promptly leased the site to a father and son team of miners named Fred J. Oberer, Sr., and Jr. The Oberers set up a mill on the Wall Street site, with Keys' assistance. Keys had earlier acquired a two-stamp mill which was still located at the old Pinyon Well; the Oberers moved the stamp battery to the Wall Street site in their truck. Keys also provided machinery that he had salvaged from other mines and mills. The Oberers set up their mill on the side of the dry wash; Willis Keys estimated it was 200-300' south of the Booth/McInnes cabin and well. There is currently a concrete pad about 160' south of the well, which may be the site of the old mill. The Oberer family, including the son's wife and a couple of children, lived in the cabin nearby.[27]

The Oberers claimed a number of additional mines, including the Black Tiger Mine and the Moonbeam, a mile east of the mill site.[28] They also leased the Gold Tiger (Black Butte) Mine from

Keys. The pair made some mill runs, but were not satisfied with their gold production. The son soon left. Oberer Sr. stopped mining, and neglected to make payments on the lease. Keys later evicted him and took over the mill in 1931.[29]

At that time Depression-era prospectors were coming into the region, doing hard-rock mining. This rock contained gold, and had to be milled to extract the precious metal. Many miners wanted Keys to mill their ore. Keys, however, believed that Oberer had set up the mill in an impractical manner (Keys may have run the mill for a short while), and was not satisfied with the old timbers used in the construction of the structure.

Keys decided to rebuild the mill on a new site. He tore down the old mill and excavated an area on a slope for the new building at the current location. (It was common for ore processing buildings to be built on an incline to take advantage of gravity to move the ore.) Mr. Hopper, a millwright in Cottonwood Springs (a camp about thirty miles southeast), had been working Jim Crowley's Margaret (Golden Bell) Mine in the east end of the Hexie Mountains. Hopper wanted this ore milled by Keys. Keys in turn proposed that Hopper rebuild the mill for him, whereupon Keys would let Hopper mill his ore there in exchange. Hopper agreed and moved to the site with his wife, a daughter, and the wife's son, who helped in the construction.

Crowley was the carpenter of the new mill.[30] He used large timbers to build the sturdy, stable framework of the core of the mill, including the ore bin, the stamp battery support, and the tramway structure. He also crafted the mortise and tenon joints in the framing.[31] Keys provided new timber for the heavy structure, which was unusual for the master salvager. Two large pine logs, positioned diagonally in the south wall, formed a support structure. Apparently the men together built the wood framework of the mill building, and Mrs. Hopper may have helped them. Upon completion of the mill, Hopper ran his Margaret ore, until he and his family moved on.[32]

Although most of the framing for the structure may have been constructed at that time, it was not done in the same pattern. Deck floors were wood-planked and floors on grade were dirt. The building measured about 20' x 36'. Originally, it consisted of only a heavy timber frame, with no roofing or walls. Keys soon put a tar-paper roof over the engine, and enclosed the engine room, using vertical board and batten. Later, probably in the mid-1930s, Keys installed corrugated metal roofing over the north end, shading the amalgamation table and concentration table. In time, he added metal roofing to the rest of the building.[33] The corrugated metal exterior siding was apparently not erected until the mid-1960s.

Several years after the mill was constructed Keys created an office by enclosing the northwest corner with horizontal tongue-and-groove boards. He kept records there on his clients, the amount of ore milled, and the amount of gold extracted. He also kept sets of balance scales there to weigh the gold and mercury. On cold winter days, a pot-bellied stove made the room a cozy place to get a hot cup of coffee. From the office, Keys could see the layout of the whole main floor of the mill and, perhaps even more importantly, he could hear the machines. The millman could monitor the mill by ear; the sound told him if there was too much or too little ore, if the stamps were hitting correctly, if there was the right amount of water, if the shaking table was operating smoothly, or if the engine needed adjustment.[34] Currently, the building is generally in good, though deteriorating, condition. Various windows and some floor boards are missing.

Dates of Operation of the Wall Street Mill

1931-1942

Wall Street was a custom mill in that it processed ore that came from a number of individually-owned mines, too small to have their own mills, or from prospects that were being tested to see if they would be profitable. The Wall Street Mill was important locally because of this custom-milling function: it no doubt helped a number of small operations to survive.

The Wall Street Mill opened for business in late 1931 or early 1932. Keys asked Oran Booth to run the facility. Booth subsequently moved back to the cabin that he and McInnes had built, working the Wall Street Mill as a one-man operation.[35]

Although it was a relatively small mill, it was not easy to operate. The stamp mill was rated at two tons per twenty-four hours per stamp, so the two stamps were expected to run four tons in twenty-four hours, according to Booth. He was paid only $1 per ton of ore stamped, so he tried to keep the stamps dropping as much as possible. He began work at about 5 a.m., preparing the mill for operation. The stamps ran from 6 a.m. to 9 p.m., with an additional hour cleaning up in the evening. At best, he was able to mill about 2-1/2 tons per day, since he frequently had to stop the stamps when a belt broke, or a machine needed fixing, or when he had to shovel out the sump. "It was a bunch of junk!," Booth recalls, noting "anybody who worked there sure earned their money."[36] In the spring of 1932, after working at the Wall Street Mill for several months, Booth left Keys' ranch to devote his time to mining. He and Keys remained life-long friends.

The mill remained open until 1942. The earlier years were the busiest, peaking in 1936. During the eleven-year period of operation, the plant worked on demand; it did not function on a regular, full-time basis. When a miner brought some ore to the mill, Keys opened the facility. The Wall Street Mill sometimes remained open for several months, closing for a month or so afterward until another shipment arrived. Mill runs ranged from a wheelbarrowfull to fifty tons, though most were less than ten tons. Willis Keys said that the mill could process five tons a day if it operated on a twenty-four hour basis.[37] The Wall Street Mill did indeed operate on a round-the-clock basis if the mill run was large and there were enough helpers. The plant occasionally worked continuously for two weeks at a time.

After Booth left, Keys operated the mill himself, with occasional assistance from his brothers-in-law, Al and Lancing "Buster" Lawton, or from the miner whose ore was being milled at the time and who often stayed at the bunkhouse during the process. Occasionally, if Keys was not available, he allowed the miner to run the mill by himself, although he preferred to be present.[38]

The Wall Street Mill closed as a result of World War II. Order L-208 of the War Production Board stopped gold mining (and therefore milling) in December 1942, lasting for the duration of the war. Miners were thus made available for work in strategic metal mines.[39]

Keys was a thorn in the side of the federal government concerning his rights as a landholder within the Monument. It was later noted that Keys "used to flay the National Park Service with caustic rhetoric."[40] His cattle grazing rights were an especially sore point, and he had an ongoing battle with the bureaucracy over this issue. By 1943 he was the last landholder within the Monument who still owned cattle. At that time he had two hundred head of cattle, though he usually ranged only twenty to sixty head at a time.[41] These cattle grazed in the Queen Valley, and Keys watered them at the Wall Street well. There were two cattle troughs and one tank near the well. The cattle troughs held 300 gallons together, and the tank held 500 gallons.[42]

At the same time, Keys was having a property dispute with his neighbor, Worth Bagley, concerning Keys' access to the Wall Street well. One day while Keys was returning from the well, Bagley confronted him. Each man stood on opposite sides of the San Bernardino/Riverside county line. The dispute reached a climax, and Bagley was shot dead. Keys went to the sheriff's office, and explained that Bagley had shot at him, so he returned the fire in self defense. Keys was placed on trial in Riverside County, and was convicted of manslaughter in August 1943. He was

sentenced to San Quentin for up to ten years, but was paroled after serving almost five years. The entire time, Keys maintained his innocence, and with the assistance of writer Earl Stanley Gardner, evidence was uncovered which persuaded the governor to grant Keys a full pardon in 1956.[43] Following his penchant for stone work, Keys erected a marker at the scene of the shooting, along the trail to the Wall Street Mill, on which he carved: "Here is where Worth Bagly [sic] bit the dust at the hand of W.F. Keys May 11, 1943."

During the war, there was a widespread move to salvage metal. Many mines and mills in the country were scrapped at that time, so it is unusual to have a complete mill, such as the Wall Street, still in existence. Perhaps having the mill on the property of a convicted murderer helped to deter salvagers.

1949

In 1948, Bill's son Willis was out of the armed forces, and out of money. He and some equally penniless Los Angeles friends decided to mine the Desert Queen, and reopen the Wall Street Mill to mill the ore. Willis became acquainted with a man named Bob Heppler through their common interest in motorcycles. After returning from the service, he met Bob's wife Lola, and two other men, Bill Workman and Bud Smith, through Heppler.

The group moved to the Wall Street Mill, and once again Booth's cabin was called into service. The years had been hard on the structure, so the friends did some major repairs. They also began constructing some additions, none of which were ever really finished. They extended the floor plan to about 40' x 40', and added a second story to the addition. Farther to the east, they dug a pit and built an outhouse above it. The National Park Service later determined that these two structures did not have historical significance, and were not included on the National Register. The bunkhouse was later demolished after it partially collapsed due to lack of maintenance.[44] The lumber for the outhouse is still in a heap where it collapsed.

The friends also cleaned out the well, returning it to operating order. For transportation they used an old 1929 Lincoln, which they converted into a pickup (it is still on the site), and each had a motorcycle.[45] The group began working the Desert Queen in the autumn of 1948, but the lack of equipment created obstacles which limited production. They closed the mill for three months in the winter, and spent most of their time looking for wood to burn for warmth. By the spring of 1949 the mill was back in shape and running once more, but the venture ended that summer. "We made about beans and that was all," Willis remembered later,

but he added that they had a great time while they were doing it. Willis and Workman continued to live in the bunkhouse for a while, but they worked for different outfits and did not operate the mill during that time.[46]

It is possible that the mill opened briefly in March 1953 to process five tons of ore for a Mr. Wilburg. However, this small quantity of ore could hardly have justified the extensive preparations that would have been necessary, since the mill had been idle for four years. In addition, Wilburg's claim, which was north of Twentynine Palms, contained more rare earth metals than gold.[47]

1966

Bill Keys reopened and again briefly operated the Wall Street Mill in 1966, when he was almost 87 years old. He had several assistants, some of whom moved to the ranch after his wife Frances died in 1963. Mike Perkins, whose father had been a long-time friend of Keys, lived with Bill on and off for several years, helping him on the ranch and collecting historical data. Mike was the engineer at the mill, and kept a log of the activities there. Paulo Krucero also lived there sporadically in the late 1960s, acting as the carpenter at the mill. Ed Braden was the chief mechanic, and was responsible for repairing and maintaining the equipment. Chet Peterson and Frank Ortiz were also involved in the operation.[48]

The preparations began in April 1966 to reopen the Wall Street Mill. The well was cleared out, the engines were cleaned and oiled, and general maintenance was performed. The mill was still not enclosed, so Krucero hung the corrugated metal walls that are currently so prominent on the structure. On August 14 the plant began milling the first of just over 1000 tons of ore. The ore originated primarily from the Pleasant Valley Mine, along with some from the Desert Queen and the Black Butte.[49]

The group defined four jobs at the mill: ore tender or crusher man, who sorted, weighed and hoisted ore and fed the crusher; amalgamator, who tended the feeding and adjustment of the stamps and table clean-up; engineer, who tended to the engines and related equipment, including pumping water; and the tailings pond tender, who cleaned out muck from the pond, panned out mercury at the end of the table to be reused on the upper plate, and completed general duties about the mill. However, it was only necessary for two men to work full-time, and one part-time.[50]

The official log of the 1966 operation provides a vivid description of daily life at the mill. There were endless

repairs, adjustments and tinkering with the machinery: the height of the stamps/tappets needed repeated modification so that both stamps operated at full capacity; the two engines continuously needed adjustments to their various parts; the impeller belt system gave them trouble; the winch belt slipped and needed tightening; belts broke and had to be laced; the engine ran out of gas and stopped; the ore car tipped while going up the tram, dumping the contents. Water was a constant source of concern, due to low water level and the impeller and engine problems. Oran Booth had experienced the same frustrations thirty-four years earlier, when he operated the mill by himself. Bill Keys certainly must have felt the same during this period. Despite all the problems, however, the mill did still operate, even though the technology was obsolete and the odds were against it.

The run was completed by August 31, and the stamps were stopped. The partners had extracted about fourteen ounces of gold, which Keys molded into a brick.[51] This marked the last time that the Wall Street Mill operated.

Bill Keys died on June 28, 1969. At the time of his death the Wall Street Mill was an unpatented validated mill site, and was appraised at $3,000.[52]

TECHNICAL PROCESS OF MILLING ORE

Stamp Mills

Gold ore is rock which contains gold. Much of the gold ore that occurs in California is of a type that is called free milling. The gold occurs as small particles which can be released by crushing the rock (gangue).[53] Milling is a process which extracts valuable metals from the valueless minerals which encase them. Stamp (or amalgamation) mills extracted gold by first crushing the ore with the stamps to release the gold particles. Next, gold was exposed to mercury, which formed an alloy called amalgam. Stamp mills were well suited to treating free milling ores.[54]

Stamp mills were the standard for many years in California and the West; the most highly developed gravity stamp mill was called the California Stamp Mill.[55] The popularity of stamp mills spread quickly after the first one in the state was erected in 1850.[56] Stamp mills were favored because they had a simple mechanical design, were relatively easy to set up and operate (without the operator being a skilled mechanic), were fairly inexpensive to operate, were sturdily constructed and easily repaired.

However, stamp/amalgamation mills were cumbersome and required a great deal of space due to their heavy frames and large foundations. The initial investment and transportation costs were high, and they did not adapt well to dry crushing. Nonetheless, the advantages so greatly exceeded the disadvantages that the stamp mill continued in its favored position for many years.[57]

By the 1930s, substitute methods of grinding and milling had been developed which eroded the stamp mill's popularity. At that time there were six common methods of extracting gold. Ores could be treated by one or more methods: 1) hand sorting; 2) amalgamation; 3) smelting; 4) gravity concentration; 5) flotation concentration; and 6) cyanidation. The success of the latter two processes promoted their use over amalgamation. In addition, ball and tube mills were substituted at many newer, larger plants because they were more efficient than stamps.[58] Nonetheless, in the 1930s "thousands of stamps [were] still dropping in numerous mills throughout the world."[59]

OPERATION OF THE WALL STREET MILL

Milling Fees

As a custom mill, the Wall Street processed ore from a variety of mines which did not have their own integrated mill. Keys charged a flat $5 per ton milling fee ($1 of which went to Booth). This was comparable to charges at other mills in the region.[60] The miner retained ownership of the ore, and when the gold was removed, Keys returned it. Early California mills had used this method. However, a standard practice of purchasing the ore by paying a price based on the value of an assay minus a fee for milling costs developed.[61] Keys' method was thus out of fashion, but it was easier for him, because it did not require him to assay the ore that he milled. This is indicative of the relaxed methods that were used at the Wall Street Mill.

As many of the miners were cash-poor, they did not always have the money to pay the milling charge. In these cases, Keys kept the gold and sent it to the U.S. Mint himself. When the Mint sent payment, Keys withdrew the milling charge, and gave the miner the balance. Individuals who planned to make a living from their mining liked to obtain at least $20 per ton at the mill. Ore milled at the Wall Street Mill averaged a little higher than that.[62] It was not unusual, however, to mill only $10-$15 per ton; those mines were usually subsequently abandoned.[63]

Since Keys did not assay the ore prior to milling, he did not know if it had much value until after processing. This resulted in situations in which the ore produced too little gold to cover the milling charge. One such instance involved an outfit in the Gold Park Mining District, run by Mr. Jensen (a big man known as the "horrible Swede") and Elwood Ives, his financial partner. Jensen and Ives mined twenty-six tons, and hauled it to the Wall Street Mill in Ives' four-cylinder Chevrolet pickup and Jensen's Ford of about the same size and vintage. After the ore was milled, only about $71 in gold was revealed, although the milling fee owed to Keys was $130. As a result, Keys kept the gold bullion. Ives was reasonable about the situation, and eventually worked off the payment.[64]

Another example occurred with Goldfields of America, Inc., in the mid-1930s. The company sold stock and had corporate offices in San Bernardino. It had several mining claims in Pinto Basin, from which it hauled twenty-nine tons of ore to the Wall Street Mill. Again, the ore did not contain enough gold to pay for the milling charge, producing less than $100 worth of gold while the charge incurred was $145. Keys was forced to go to the company's office (about eighty miles away) to obtain payment.[65]

The miner, who retained possession of the ore, often stayed at the Wall Street Mill while his ore was being milled. When Oran Booth worked the mill, he insisted that the owner be present during the entire process, to the extent that the owner slept in a cot next to the amalgamation table. Booth was familiar with complaints about mill men who stole gold, and went to extremes to prevent the start of rumors about his own practices.[66]

Mines That Used The Wall Street Mill

Keys used the Wall Street Mill to process ore from his own mines, as well as from numerous small mines in the Pinon and Gold Park Mining Districts. Frances Keys' obituary noted that Keys had milled for "50 miners in the area," but that number was probably exaggerated.[67]

Although Keys held mineral rights to numerous claims over the years, very few generated a large return. His most productive mine was the Desert Queen, which is now on the National Register of Historic Places. Keys used the Wall Street Mill to process some, but not all, of his Desert Queen ore. In addition, he milled ore from his own Hidden Gold Mine.[68]

Keys left two sets of records regarding his activities in custom milling operations. One is an accounting page, the other consists of handwritten notes on the wall of the mill. The page includes mill runs between September 1934 and October 1937. It lists the names of the customers and their mines, the amount of ore milled and the gold retrieved. Keys listed only seven mines that used the mill during those thirty-eight months, for a total of sixteen mill runs. Fifteen of the mill runs weighed between one and twelve tons (the sixteenth weighed twenty-five tons). The average weight for all the runs was seven tons. The ore produced an average of .751 ounces of gold per ton, ranging from .16 to 2.03 ounces per ton for the different mines. At $35 per ounce, the average ton produced about $26. The mines listed on the sheet were the Dickie Boy, the Gold Point, Goldfields of America, the D-C [later known as the Elton], Schapel's, the Blue Bell, and the Desert Queen.[69] The production and accounting notes that Keys wrote on the wall also included these mines, as well as the Paymaster, the Ragman, the Tiger (Gold Tiger a.k.a. Black Butte or Black Tiger), Wilburg, and M. Shay. These notes were not as thorough and have suffered from exposure, making them difficult to decipher. The record appears to cover the period from January 1934 to March 1953. About half of the mill runs are duplicated on the two records. The fact that production and accounting records were jotted on the wall is indicative of the operating style of the Wall Street Mill.[70]

Ore from other mines also arrived here for processing. Ore from the Margaret was the first ore milled, as discussed above. Oran Booth used the mill when he had the Sunset claim in 1932. That mine was so isolated he used two burros to pack the ore to White Tank, where he transferred it to a vehicle.[71] Ore was also packed out on burros at the Black Eagle (Eagle Cliff). Keys' brother-in-law, Albert Lawton, and a partner operated the claim in 1933 and had the ore milled at the Wall Street Mill. It is possible that Bill Keys had the rights on the mine at that time. The Golden Bee ore, mined by "Frenchy" Auclair, went to the Wall Street Mill. The Monroe Mine (later the B & B), near the Desert Queen Mine, had been owned by a Mr. Monroe until his death in 1928. A series of people, including a Mr. Bloeser, leased the mine from the heirs and hauled the ore to the Wall Street Mill.[72] Some of the lessees of the Tulley Mine (renamed the Crown Prince) also took their ore to the mill. This is the claim that Reverend Tulley mined when he operated his arrastra at the Wall Street site at the turn of the century.[73] In addition to these mines, prospectors also brought five or ten tons of ore from test holes to be milled. The results indicated the profitability of the claims.

When Bill Keys' son, Willis, operated the mill in 1948, he milled ore only from the Desert Queen. In 1966, when the Wall Street Mill reopened briefly, it processed ore from the Desert Queen, the Black Butte and the Pleasant Valley Mines.[74]

The Milling Process and Equipment

Arrival of Ore and Transfer to Ore Car

It was the responsibility of the mineowner to transport the ore to the Wall Street Mill. Upon arrival, itwas transferred by hand-shoveling to an empty ore car standing at the bottom of the inclined tramway, which extended about 65 feet to the top of the mill building.

The mill did not have a scale in the early years, so Keys and Booth estimated the quantity of arriving ore based on the approximated 600 pound capacity of an ore car.[75] Later, Keys brought a platform scale over from the ranch. However, he only weighed one car-load per mill run, and multiplied that weight by the number of cars.[76] The tram used in 1939 and 1966 held 1000 pounds, and was made by the Fulton Engine Works of Los Angeles.[77] National Monument personnel later moved the ore car to the Lost Horse Ranger Station for safekeeping.

A winch, mounted at the top of the mill, pulled the car up the tramway. The drum and drive pulley assembly for the winch came from the Paymaster Mine, but it lay at the ranch for years before it was used at the mill. The counter shaft pulleys and lever were assembled from parts stored at the ranch.[78] The cable went from the tram to a small pulley mounted on a tall wooden framework on top of the mill (above the crusher), then back to the winch where it wrapped around the hoist drum. The main engine powered the winch. Power was transferred from the main shaft by a belt which turned an idler shaft next to the winch. A small-diameter, leather-faced pulley was also on that idler pulley, opposite the big pulley on the hoist drum. The hoist drum was anchored on one end, but had a sliding bearing on the end where the big pulley was. The hand lever was connected to the bearing via a rod. When the operator pushed the lever forward, it slid the big pulley against the little pulley (which was turning on the idler shaft). This then turned the hoist drum, which pulled the cable and ore car. When the car reached the level platform at the top, the operator pulled back on the lever and the ore car tipped its contents onto the grizzly.[79]

Grizzly

A grizzly was a stationary grate which detoured the small pieces of rock away from the crusher, relieving the machine of unnecessary work. The grate was composed of parallel steel bars, spaced about 1-3/8" apart. It was set at about a 15 degree angle, and sat on top of an opening to the ore bin. Pieces of rock that were small enough to go through the bars fell into the bin. The bars were tapered, with the wide edge on the top, to prevent rocks from wedging in the spaces. The Oberers did not have a grizzly when they operated the mill on the nearby site. Keys acquired a large grizzly from another mill, possibly the Eldorado, and cut it down to size to fit the Wall Street Mill. The grate was installed when the mill was built on the current site, or possibly a short time later.[80] The rocks that were too large to go through the grizzly slid onto the sheet metal flooring of the platform. If a piece of ore was larger than the opening of the crusher, the millman broke the rock with a sledge. He then shoveled or hand loaded the ore into the crusher. This was a weak point in the design of the Wall Street Mill: if the grizzly was higher than the crusher, as was customary, the pieces would have slid into the crusher, making hand shoveling unnecessary.

Jaw Crusher

A jaw crusher, or rock breaker, used compression to break the ore. This preliminary crushing was done by a breaker because it was much less expensive to operate than the stamps.[81] Ore was placed in an opening between two metal jaw plates. One plate was immobile, the other was hinged on top (which classified it as a Blake-type crusher).[82] That plate swung towards the other in short, rapid movements, breaking rock with each inward stroke. When pieces were smaller than the opening between the plates, they fell down into the ore bin to join the rocks from the grizzly. Jaw crushers vibrated excessively and required heavy foundations. The Wall Street Mill crusher broke the rock down to about 1 to 1-1/2" diameter pieces.[83] Willis Keys worked as the crusherman when he was young. He hauled up the ore with the hoist and fed the crusher. The machine was quite noisy, especially while it worked on hard quartz rock. He turned his head aside when he threw in a big chunk of rock because pieces tended to fly out.[84]

The crusher currently at the mill was manufactured by Fulton Engine Works of Los Angeles, which made mining, milling, hoisting and pumping machinery.[85] It is a typical jaw crusher, operating at about 500 r.p.m.[86]

The crusher presently at the Wall Street site is not the original machinery. Keys initially brought a Dodge No. 3 rock breaker to the Wall Street from the one-stamp mill he had stored at his ranch. He used this crusher for a time, but found that it was too small for the job and brought in a larger one.[87] The present crusher has a circuitous history. Keys had sold the Hidden Gold Mine to Milton L. Knapp in the spring of 1930.[88] As a condition of the sale, Keys provided a mill, which he built at the closest water source, approximately nine miles to the southwest, in Pushawalla Canyon.[89] When Knapp went bankrupt, he left the equipment at the site. In the tradition of salvaging carried on in the desert, the crusher made its way to George Michels' mill in Twentynine Palms. Keys and Booth visited Michels one day, and Booth had to restrain Keys when he noticed the crusher there. Michels denied that the crusher belonged to Keys, but Keys insisted he could prove it was his because he had the patterns for the jaw plates. Keys instructed Michels to return it, and when Michels failed to do so, Keys moved it himself.[90]

Ore Bin to Ore Feeder

The bin could hold about four tons of ore in a triangular chute.[91] It connected to an automatic ore feeder which regulated the flow of ore to the mortar so that an optimum amount of

material was under the stamps. Since the feeder was activated by the stamps, the details of the mechanism will be discussed below. The original feeder was a rotary model. Keys did not like the way it worked, so he contracted Hopper to build a new one when the mill was located on this site. Hopper's version worked quite satisfactorily.[92]

Stamp Battery

History. The stamp battery was the center of attention in a mill. It ground ore into a fine sand, using a pounding action, similar to a hammer and anvil. An eye-catching, decorated plaque on the Wall Street stamp battery is inscribed "Built by Baker Iron Works, Los Angeles, for E. Holland & Co." The date 1891 is marked on the back of the battery. The Baker Iron Works was a large, long established company which manufactured (or were agents for) a wide variety of milling, pumping, agricultural, heating and ventilating equipment. Ed Holland was a mining engineer who was in business with Alfred G. Tingman, a Southern Pacific Railroad agent; both were from Indio (about twenty miles southwest of the Wall Street Mill). Their company mined the Pinon Mountain area, about ten miles south of Keys' mill. Holland and Tingman erected a steam-powered mill at Pinyon Well in 1890 or 1891, and installed the Baker stamp battery in it.[93]

The stamp mill was a custom made unit that reportedly cost about $3,000. It was shipped via Southern Pacific Railway from Los Angeles to Indio, and then hauled by freight wagon up Blue Cut Canyon to Pinyon Well.[94] The Blue Cut was a teamster's highway which had an easier grade than the major route from Indio to Pinyon Well through Pushawalla Canyon.[95]

The Pinyon Well was a center of activity for the southern Pinon Mining District due to the availability of water. A small camp grew at the location, and by 1907 there were several cabins near the mill where families lived. The Pinyon Mill processed ore from several mines. Jim McHaney brought Desert Queen ore there when he owned that mine in 1895.[96]

Around 1912 or 1913, E. Holland and Company sold the mill and surrounding property to W.A. Sherwood & Company, which operated the Dewey Mine. That mine was apparently involved in a stock fraud, so it is possible that little or no Dewey ore was taken to the mill. In any case, the mill stayed set up at the Pinyon Well, where there was water. The Pinyon Well Mill was abandoned by 1918, when it was purchased by the owners of the New Eldorado Mine. (Ownership and management of that company bounced around among several people, including John H. White and Fred Vaile.) The company claimed Pinyon Well for the New Eldorado Mill site in

1921, and patented the land in 1923. However, the company only used the site as a source of water, which they pumped nine miles to a mill at their mine site. In 1923 the wreck of the old two-stamp mill at Pinyon Well was still sitting unused. Keys acquired the mill from Fred Vaile of the New Eldorado Mining Company in 1930. Fred Oberer Sr. and Jr. moved the stamp battery from the Pinyon Well site to the Wall Street Mill.[97]

Components. A stamp battery can be likened to a hammer and anvil. A heavy metal shoe was attached to the bottom of a long vertical stem (similar to a hammer head on a handle.) A die received the blow from the shoe similar to an anvil. The die, a cylindrical piece of iron or steel, sat in the bottom of a heavy metal trough called a mortar (or mortar box). The shoe was also enclosed in the mortar. The box was screened on at least one side and contained water, ore and mercury. In a gravity mill, such as at Wall Street, a cam and tappet lifted the stem and shoe, which then dropped by its own weight, that is, by gravity. The violent action of the plummeting shoe crushed the ore and forced the finer particles, along with some water, through the screen. Since the stamps dropped alternately, a wave motion was set up, and the pulp (the water/ore mixture) rushed out in regular spurts. Pieces that were still too large stayed in the box for another repetition of stamping. Some of the gold adhered to the mercury in the mortar, and dropped to the bottom of that box. One mortar with the accompanying stamps, cams, frames, and other accessories was called a stamp battery.[98] In a gravity stamp mill one mortar usually contained two, three or five stamps, although five was the almost universally accepted number in this country.[99] Thus, the Wall Street Mill, with two, had an uncommon number of stamps in its battery.

The capacity of a mill was measured by the number of stamps. Mills were usually set up with multiples of five stamps. Ten stamps was a common mill size but there could be as many as eighty or even one hundred.[100] The two-stamp Wall Street Mill was thus smaller than the typical mill.

A stamp was composed of a stem, a shoe, a boss, and a tappet. The center piece was the stem, a long rod, about 3" in diameter, and made of solid metal, either iron or steel, and tapered at both ends, so it could be reversed if one end broke. The shoe, which attached to the bottom of the stem, was shaped like a cylinder topped by a truncated cone. They weighed between 85 and 200 pounds when new, and about 20 to 50 pounds when worn out. The life of a shoe varied between about 85 and 900 tons of ore processed.[101] The Wall Street Mill "didn't have work enough to wear them down very fast," according to Booth.[102] The stamp head or boss was a cylindrical metal piece that connected the shoe to

the stem, and added weight. The mill used standard shoes, bosses and dies, and some partly worn ones that could be reused are still in the building.

Tappets were connected to the stems, towards the top end. Next to the tappet, a cam rotated on a horizontal shaft. The flange on the cam moved under the tappet, lifting it (and the stem and shoe). When the edge of the flange moved away, the tappet fell, and the shoe dropped onto the ore in the mortar. The cams were designed to make the stamp rotate slightly with each drop, to average the wear on the shoe and die.[103] Keys thought there was too much spin on his stems, so he attached a piece of belting fabric around each stem just above the tappet, and wired it to the frame, to slow down the rotation.[104] As the shoe wore down, the height of the drop was adjusted by moving the tappet on the stem.

There are conflicting reports about the weight of the Wall Street stamps (that is, the stem and its attachments). The state mineralologist reported that at a mill at Pinyon Well each stamp weighed 850 pounds. However, there may have been two mills at that site. Willis Keys believes the stamps weighed about 900 pounds, because they were a little smaller than full-sized stamps. Oran Booth and the log book from 1966 state that the stamps weighed 1,000 pounds.[105]

Each stamp dropped about sixty times per minute, or 120 drops per set. Keys wanted them to drop as fast as possible, so that ore could be processed quickly. However, if they moved too fast, the tappet hit the cam on the way up. The speed, therefore, was regulated primarily by the belts and pulleys and partially by the engine.[106]

Ore. One aspect of the millman's skill was knowing and controlling the right combination of ore, water, and mercury, with the right size screen. When the shoes dropped in the mortar, they landed on about 1-2" of ore. It was important to have enough ore in the mortar, because if the shoe struck the die it would quickly wear down both pieces. On the other hand, too much ore would result in inefficient grinding. Most mills, including Wall Street, used automatic ore feeders, which were activated by the fall of the stamps. Ore slid down the inclined ore bin to the feeder, which was on the uphill side of the mortar. A door with an adjustable opening allowed a certain amount of rock onto a small metal platform. Connected to this was a vertical rod which extended up to the level of the tappets, and a horizontal lever, with a bumper, or knob, on the end. The knob was just under the west tappet at the Wall Street Mill. When the level of ore was low in the mortar, the shoes and

tappets dropped lower, and the tappet hit the knob. This jiggled the lip of the small platform, which knocked some rocks into the mortar. In turn, the shoe and tappet were raised higher, and the tappet did not strike the knob.

The millman operated the stamps by sound and feel. Too little ore produced a distinctive clatter, and too much ore had a "squishy" sound. The millman wanted to hear a peculiar ringing sound, which indicated that the right amount of ore was in the mortar. He also held the stem and followed it down while it struck a blow. If the load was too great, the shoe fell with a dull sinking blow and bounced up slightly. Too little feed also made a rebound, but it had more of a kick-back. The correct amount produced a hard, sharp blow with little indication of rebound.[107]

Water. Another element of the millman's formula was the quantity of water added. The liquid flushed out the pulp and carried it over the amalgamation plates. The millman tried to keep a semi-thick slurry mixture in the mortar (which was also the right consistency for amalgamating). Too much water washed ore away from under the stamps and made too much of a splash. The pulp would not flow enough if there was too little water. At the Wall Street Mill, the water supply was regulated by a pipe which fed into the mortar from the water tanks.

Mercury. The environment inside the mortar provided a good opportunity for amalgamation. The stamps scoured the gold clean and the churning action gave it a chance to come into contact with the mercury. As a result, Keys tried to amalgamate inside the battery as much as possible. He added mercury directly into the battery, through the feed chute. The amount varied with the ore, but it was about a drop or two every fifteen to sixty minutes. This accrued to about two ounces of mercury per ounce of gold.[108] Keys knew the ores pretty well so he had a good idea of how much to put in for each type. The millman monitored the amalgamation table to determine the status of the mercury in the box.[109]

The Wall Street Mill also used 3" x 6" mercury-coated copper plates inside the mortar. This method was not always successful in stamp mills, because the sand and rock surged around the inside of the box, and sometimes scrubbed off the quicksilver and amalgam from the plates. However, the character of the ore and stamp action in the Wall Street Mill were amenable to the process, and there was a good recovery of gold on the plates.[110]

Screen. The screen was another important factor in the stamp process. Mortars with screen openings only in the front were called single issue; those with screens in both the front and back were called double issue. It was not unusual for mills with a double issue to only use the front screen. Currently, the Wall Street Mill is set up to use only one screen. This screen sat in the outlet of the mortar in window screen fashion, above the table. Keys used a plate punched with slots in a diagonal pattern.[111] The screen is missing from the Wall Street Mill, although scraps of it are in the building. The size of the holes are about that of a grain of sugar or salt. Ore stayed in the mortar until it could go through the holes.

The size and number of openings in the screen depended on the type of gold that was milled. If the ore contained coarse gold, Keys used a 30 mesh screen, which had larger openings. It allowed the pulp to flow through fairly easily. When the ore contained finer gold, Keys used a fine screen, such as a 40 mesh. However, the finer screen slowed the process because it limited the tonnage that passed through it, and it clogged easily. The mill used a 35 mesh screen in its 1966 operation.[112]

Amalgamation Table

Amalgamation was a process in which gold was placed in contact with mercury. The substances linked together and formed an alloy called amalgam. After separation from the ore, the gold and mercury could be easily isolated. It was the principal means of recovering gold from ores until the successful introduction of the cyanide and flotation processes. Although these new techniques were common in the larger plants of the 1930s, amalgamation continued in importance, particularly in small mills. It was well adapted to small-scale operations because of relatively low plant cost, simplicity, flexibility, cheapness of operation in small units, and good recovery from variable grades and volume of feed. This last quality was especially important in custom mills, such as the Wall Street Mill.[113]

Amalgamation tables had a basic design which changed little over the years. The surface of the table slanted away from the mortar. The top was covered with silver-plated copper plates which were coated with mercury. These plates were positioned in a stair-step design; the drops between the plates increased the chance of catching gold by turning over the pulp and exposing more gold to the mercury. The table was positioned a few inches lower than the mortar. The pulp dropped onto the table and flowed over it in constantly recurring waves, corresponding to the wave action in the mortar. This movement provided a better opportunity for gold particles to come into contact with the

mercury. A ridge of amalgam could be found at the drop below the mortar, and at the drop between the plates. There was a mercury trap at the foot of the table. The pulp ran into the trap, and any loose mercury or amalgam, being heavier, stayed in the bottom.

The amalgamation table at the Wall Street Mill was assembled when the mill was put in its present location. The table had two copper plates, with about a 2"-3" drop between them.[114] The plates were just over 2' wide; the upper one was about 54" long, and the lower one was about 40" long.[115] Keys had these plates silvered several times since low grade ore wore off the plating. Plates that were not silvered did not work well, and turned green. Keys owned a number of copper plates; the origin of these particular plates is not known. They have been moved to the Joshua Tree National Monument Museum for safekeeping. The rest of the table is still at the mill.

On the morning of a mill run, before the stamps started dropping, the millman dressed the plates. A good-sized scrub brush, water, and mercury were needed for the job. Keys kept the mercury in small food jars (possibly one-pint fruit jars), with a thin piece of canvas tied across the top. He purchased mercury in seventy-six pound steel cans, called flasks, from mining supply outfits, probably in Los Angeles or San Bernardino, where he obtained most of his supplies. The millman shook the jar, like a salt shaker, over the plate, which sprinkled the mercury. The brush was used to work the mercury and water over the surface of the plate, pushing the liquid back and forth to get even distribution.[116]

After the stamp battery was started, the operator was required to constantly monitor the amount of mercury on the plate. Some mills had automatic mercury feeders, but at Wall Street the millman had to slide his finger over the plate to determine the proper level. If the mercury appeared solid and hard, forming ridges, more mercury would be added to the mortar. If there was too much liquid present, the mercury would be slick and run faster than necessary. The millman wanted the surface to feel like mushy putty.[117]

When the mill first opened it had just had one screen which exited to the amalgamating table on the north side. Keys wanted to increase production, so he later added another screen on the back of the mortar to serve a second table, under the ore chute. He later removed the additional screen and table.[118]

Amalgamation did not remove all of the gold. A government investigator reported in 1937 that mills in the monument recovered 65-70% of the precious metal.[119] Assays of the Wall Street Mill tailings in 1935 averaged about $17 per ton.[120]

Calculations from Keys' accounting sheet indicate that the average value recovered was $26.28 per ton.[121] This indicates a recovery of about 61% at the Wall Street Mill.

Cleanup

After all the ore had gone through the stamps, the millman collected the amalgam so that the gold could be extracted; this process was called the cleanup. Customarily, mills which purchased the ore did the cleanup at a set time (for example, once a week or once a month.) However, since the miners who went to the Wall Street Mill kept ownership of the gold ore, there had to be a clean up at the end of every run. The cleanup was always a chore and required the same amount of time no matter the size of the mill run. The process took about three-and-a-half hours in the 1966 operation.[122]

When the last of the ore had been stamped, the millman continued to run the stamps in order to flush the sand out of the mortar. To stop the stamps, he hung up the tappets. First, he got the cam stick, or skid. This was a wooden wedge which was covered with a piece of belting on the upper side (to keep the wood from getting cut up and prevent it from slipping) and grease on other side (to make it easier to slip it out). The millman placed the cam stick on the top of the revolving cam, so that as it rotated to the top, it hit the tappet and lifted it higher than usual. At the moment it reached the peak, he pushed a pivoted wooden bar (called a latch bar, finger bar, latch finger or lifter) under the tappet. This held up the tappet higher than the cam, so the stamps stopped dropping. This maneuver had to be done carefully, since the millman could pinch or even lose his fingers. The Wall Street stamps are currently in this lifted position, supported by the finger bars.

Next, the millman turned off the water and the engine. This completed, he opened the mortar and pulled out the shoes and dies. He cleaned the inside of the mortar along with the shoes and dies, using small paint brushes to reach every crevice. About two-thirds of the amalgam was found in the mortar itself, either on the small plate or settled down around the dies. It was in irregular-shaped pieces of about 1-1/2". The millman put all of the material into gold pans. Next, he scraped all the amalgam off the plate on the table, using a hard rubber or wood squeegee. Metal was not used to avoid scratching the plates. The amalgam went into the gold pans. He cleaned out the mercury trap at the end of the table, and, finally, added water to the pans and panned them by hand to get the sand out.[123]

The amalgam was silver-colored and spongy, with the consistency of heavy mud. No gold was visible in it. The millman took a piece of amalgam about 2" in diameter and put it into a chamois skin. He held it over a gold pan, and squeezed the chamois, forcing out the mercury. The gold remained inside and was then ready for retorting. Keys was always present to help with the cleanup and retorting.[124]

Retorting

After the amalgam was squeezed in the chamois, there was still a residue of mercury on the gold, which had to be removed. The gold was wrapped in a cloth and tied with string, then placed in a cast iron retort. This was a covered metal pot; it had a tube coming out of it, which was lowered into a pan of water. (There are some retorts in the museum at Joshua Tree National Monument which were used at the Wall Street Mill; one was homemade from pipe.) Keys sealed the edges of the lid and retort with mud. He built a wood fire just north of the mill, then slowly heated the retort over it. The mercury vaporized at a relatively low temperature, then rose from the retort through the pipe and into the water. There it cooled, liquified and was recovered. The gold was not hot enough to melt and remained in the retort. When the retort had cooled, it was opened; a spongy-looking gold-colored matte was inside. This gold was returned to the miner, who usually sent it to the U.S. Mint in San Francisco in this form. The whole retorting process took about an hour.[125]

Some people wanted their gold in bullion form, so Keys took their matte to the forge in his blacksmith shop at the Desert Queen Ranch. The shop was originally in a lean-to addition to the old adobe barn, but later he moved it to the long narrow shed that he built nearby. He heated the gold matte in a crucible until it melted at 1000 degrees. When it cooled, the gold formed a button. Into another crucible he put the gold button and flux (ground silica, soda, niter, sodium, and borax glass), which helped in the formation of a slag. He heated this mixture until it boiled, then continued to heat it until the impurities were boiled out. This required a lot of heat, and took about an hour. Then, if there was a small amount of gold, it was allowed to cool in the crucible. Larger amounts were poured into bullion molds, which came in various sizes. When the bullion cooled, it was cleaned with nitric acid to remove slag. Keys returned the bullion to the miner, who sent it to the mint.[126]

Concentration Table

After amalgamation, there were still valuable minerals left in the pulp. Besides gold, other metals such as lead or iron were sometimes present in the region's ores. These minerals could be concentrated by mechanically removing most of the worthless material (gangue), thereby increasing the percentage of valuable metals in the pulp. This concentrate was then melted at a smelter, which separated the individual values.

Using gravity for concentration was an old concept based on the fact that gold and other precious metals have a high specific gravity.[127] However, the invention of the Wilfley table in 1895 revolutionized the industry. The design involved a jerking, slanted table top partially covered with cleats, over which crushed ore and water flowed. The combination of the heavy minerals, the inclination, riffles, motion, water, and gravity caused the desirable metals to accumulate in distinct bands, while the lighter material was washed away. Wilfley's design generated significantly better yields, and the tables were inexpensive to purchase and operate. The success of the table motivated many people to imitate the pattern, and the market was saturated with the so-called riffle, shaking, bumping or jerking tables.

The shaking tables were universally adopted for treating medium and fine sands, and remained the standard for decades. Flotation concentration began challenging gravity concentration of gold ores in the 1930s, but through the decade the shaking table continued as the most widely used method, particularly at many old mills where the cost of changing to flotation concentration was not justified.[128]

The shaking table at the Wall Street Mill was a Myer table, built by a man of that name in Alhambra, California.[129] Keys installed it in 1933, about two years after the construction of the mill. The device came from a rotary ball mill that operated to the southeast of the Wall Street Mill, across the dry wash. This site may be the one located about 230' southeast of the mill that currently includes a broken concrete pad, some partially buried sheet metal, and tailings that appear to have originated from a ball mill. The operator, who worked the D-C (Elton) Mine, leased the site from Keys. Their agreement stipulated that the mill and any permanent improvements would stay with the property. When the mill ceased operating in about 1933, Keys moved several pieces of equipment, including the concentrating table, to the Wall Street Mill.[130]

The Myer table was roughly rectangular, with an extension on one side. The head end was the short side closest to the amalgamation table, and the concentrate end was the opposite short side. Looking towards the head end, the feed side was on the right and the tailing side on the left. The table top slanted down towards the tailing side, and also slightly towards the concentrate end. The surface was covered with linoleum, on which were attached a series of wooden strips parallel to the long sides. These formed channels, or riffles, about 1-1/2" wide. The pulp and water entered the table from the right (higher) side, close to the head end. Gravity caused the ore and water to flow across the cleats, towards the lower side. Heavier materials dropped to the surface, and were caught in the riffles between the cleats. The upper riffles usually contained the heaviest minerals, such as gold, iron and lead.

At the same time, an eccentric cam at the head end (powered by the main engine) applied a so-called "head motion," which shook the table with short, rapid strokes.[131] This moved the material towards the foot of the table, and also helped stratify the material in the riffles. Similar material within each riffle tended to stay together, even when it reached the cleaning plane, where the wooden cleats ended prior to the concentrate end of the table. The heavier minerals stayed close to the surface of the table, and so were less exposed to the wash water, which removed lighter gangue. Thus, the particles spread out in fan-like bands with clear lines of demarcation between the different minerals. As a result, minerals of differing densities arrived at different points on the concentrate end of the table. The millman adjusted a launder (a trough with a spout) on the concentrate end of the table, so it funneled the bands of minerals into a 50 gallon drum. A larger launder directed the gangue and water towards the tailings pond.[132] Keys returned the concentrate to the miner, who usually sent the it to the Selby Smelter, the closest such facility, located about 180 miles northwest in Mojave.[133]

Even after the shaking table was installed at the Wall Street Mill, it was used for only about half of the mill runs. The miner may have tested the table during his first mill run. If it did not produce a profitable result, he would not use it again. Keys did not use the concentration table during the brief run in 1966.[134]

Keys installed a ten-ton Allis ball mill northeast of the concentrating table in the summer of 1933. A ball mill was a rotating horizontal cylinder which ground ore, using balls or pebbles. This machine was probably the one that had been in the mill across the dry wash. Keys used it only briefly in connection with the stamp mill but found the results to be unsatisfactory. The ball mill was subsequently sold.[135]

Tailings

Mills located in areas where water was plentiful simply discarded the used water and tailings into a pile. However, the Wall Street's Mojave Desert setting made water a scarce and valuable commodity. The amount of water consumed by the operation of the stamp mills varied. They usually used between one and six tons of water per ton of ore.[136] Mills with a limited water source used less water, and apparently were just as effective. The well at the Wall Street could not provide enough water for a continuous milling operation, so the water in the tailings had to be reclaimed and reused. Water reclamation was not unusual for mills in water-scarce regions, but it did require additional labor, equipment and space.

The tailings and water that left the concentrating table were channeled eastward down metal troughs for about 20'. The pulp then entered a U-shaped ditch and continued another 40' to the dry creek bed, curved back to the west, and emptied into a pond about 20' from the engine room. This sump area was approximately 1-4' deep, 3-4' wide and 3-6' long.[137] In 1966 the sump was filled from the overflow of an adjacent pond.[138]

The water channel was made intentionally long so that most of the tailings settled out before the water reached the sump. The channel and the sump hole had to be kept clear, so the tailings were shoveled off to the side. This daily job was difficult; the tailings stuck to the shovel and had to be beaten off. Booth, in particular, resented this job. The stamps were stopped while he shoveled, reducing the amount of ore crushed and, therefore, the amount of his pay. In time, there were large piles of tailings on both sides of the little gulch. The piles sometimes reached 15-18' high and eventually spread to the little wash and around towards the cabin. When they got too high, Keys brought out a donkey and a slip scraper and pulled the tailings out further, to the other side of the dry wash.[139]

Meanwhile, water accumulated in the sump. A pipe connected the pond to a thousand-gallon, galvanized-iron water tank about 30' away. A centrifugal pump, operated off the main engine, impelled the water from the sump uphill to the tank, from where it could be reused in the milling process. When the tank emptied, fresh water from the well was used. This tank may have come from the Pinyon Well Mill when Oberer moved the stamp battery.[140]

Cyanide Leaching. The tailings that Keys discarded still had gold and other valuable minerals in them. This was not unusual for gold mills at that time, since no process existed that made total extraction possible. However, the cyanidation method was able to obtain a very high percentage of precious metals. The process had been invented in the late 1880s and, by the beginning of the twentieth century, improvements in the technique made it very attractive to the mineral industry. The method was based on the solubility of gold in a dilute solution of potassium cyanide or sodium cyanide; the gold was later precipitated from the solution. The technique was so effective that it was often used to treat the tailings piles of mines and mills.[141] After the increase in the price of gold in 1934, a company worked its way across the Twentynine Palms region treating tailings; the Wall Street Mill was one of their sites.

John W. Meyer and his partner Charles (Charlie) Phelps, an insurance salesman for the Northwestern Mutual Life Insurance Company in San Francisco, began leasing the Wall Street Mill late in the summer of 1935.[142] They had already tested the tailings, and believed they could make a profit through cyanidation at the site. Some of the tailings assayed as high as $20 per ton, though they averaged around $17 per ton. The partners set up their camp at the site. Meyer stayed in one walled tent, and Phelps, along with his wife and daughter, stayed in another. They used the cabin as a kitchen; it contained a crude table and some boxes for chairs. The men brought in their twelve-ton cyanide tank and set it up along the dry wash northeast of the mill. They then proceeded to hand shovel the first of 2,500 tons of tailings into the tank.[143]

After the tank was filled with tailings, a cyanide solution was introduced. The contents were agitated to ensure aeration and ample contact, then the solution was drained. The liquor then flowed through a precipitating box, consisting of a series of riffles and compartments containing zinc shavings. The gold was precipitated and fell to the bottom as a black slime. The spent tailings in the tank were shoveled out into the dry wash; the rains later washed them away. Thus, the tailings currently present at the mill only represent work after 1935.

Phelps and Meyer completed their job by November 8, 1935, and sent the precipitate to a smelter for final treatment. However, there was some confusion with the smelter concerning a gold permit, so their payment was delayed for several months. The partners' contract with Keys was arranged so that they paid him a certain amount per month, or 10% of the recovery, whichever was greater. So the partners had to keep paying Keys a certain amount per month through March, even though they had finished cyaniding the tailings in early November. When they were finally

paid by the smelter, they found they had recovered about 80-90 percent of the gold.[144]

Power

Engine. The engine was an important piece of machinery at the Wall Street Mill because it was the source of power for all of the other machines. When the mill was located at its other nearby site, Oberer used a four-cylinder engine from a Dodge car. Keys replaced the engine when he moved the mill. He brought over an engine he had at his ranch, which he had acquired at the Paymaster (Black Warrior) Mine. It was a twelve-horsepower, gasoline engine manufactured by the Western Gas Engine Company of Los Angeles under patents dated 1906. The engine, number 471, had a speed of 340 revolutions per minute.[145] It had one cylinder with a 12" stroke and a 6" bore.[146] Gasoline engines were frequently used in this region due to the lack of water and wood, or other fuel, for power. The engine used five gallons of gasoline to crush one ton of ore.[147] It had been used as a hoist engine at the Paymaster, but Keys removed the hoist mechanism since it was not necessary at the mill. The base for the hoist was on the north end of the engine; bearings for a cross shaft mark the position where the hoist drum sat.[148]

Keys used a Maxwell truck to haul the engine, in pieces, to the mill. It was set in place with a tripod and chain block; Oran Booth repaired it to working order. The Western Gas Engine Company advertised that the "cheapest and most reliable power for the miner is the popular 'Western' distillate or gas engine."[149] They also maintained that engine was successful because of its "perfected simplicity."[150] Booth would most likely have disagreed with these claims. The engine had an electric make-and-break ignition, an often unreliable system. Keys maintained that the engine worked adequately for their needs, although Booth wished to replace it with a spark-plug model. As Booth anticipated, he had trouble with the engine; the points kept getting dirty, preventing the spark from jumping and subsequently killing the engine. Finally, in the 1960s, Keys had the make-and-break ignition system changed to a spark-plug ignition.

Water to cool the engine was kept in a tank on the north side of the engine, running through a pipe from the bottom of the tank to a piston-type water pump on the east side. A second pipe returned the water to the top of the tank.

Belt and Pulley System. Power was transferred from the twelve-horsepower engine to the machinery via a system of belts and pulleys, most of which are still at the mill. This was the standard technique in mills, especially in California. The engine pulley was connected by a leather and fabric belt to the driving pulley (bull wheel) on the line shaft, about 12' away on the second level. The clutch on the engine was disengaged while starting and warming up the machine. When the clutch was engaged, the engine pulley rotated, which turned the belt and the drive pulley. This rotated the line shaft at about 200-300 rpm, turning the pulleys which connected to the various machines via a belt. The first pulley on the east end of the shaft controlled the centrifugal pump which ran water from the sump into the tank. The drive pulley was next and after it came pulleys which powered the ore car winch, the crusher, the generator (a later addition), and the large bull wheel for the stamp battery. The bull wheel was almost 4' in diameter, and was built up of laminated wood, in the traditional style of stamp mills.

On the third level of the mill, the bull wheel turned the cam shaft, which rotated the cams associated with the stamps. Keys later added an extension to this shaft, via an in-line shaft connector. He put a pulley on the extension, and its belt descended through a cut-out section of the flooring, to another drive shaft near the ceiling of the first level. The concentrating table was powered through this shaft.

When it was necessary to turn off a particular machine, the millman pulled a pick or shovel handle (there were several around the mill for this purpose) against the running belt and ran it off the pulley. To engage it when the line shaft was running, he grabbed the belt and slipped it onto the lower side of the pulley, then put pressure on it until the pulley grabbed the belt and re-engaged it. The belt that powered the stamps was rarely disconnected as the millman usually disengaged the engine if he wanted to stop the stamps.[151]

The concentration table pulley system had a more sophisticated method of disengaging the power. A drive shaft (near the ceiling) turned a counter shaft on the machine; a belt connected it to an eccentric shaft. The latter shaft had two pulleys placed close together. One was the drive pulley, which was keyed to the shaft. The other was an idler pulley which ran free. The belt was positioned between the prongs of a U-shaped lever. When this lever was moved sideways, it shifted the belt between the drive pulley and the idler pulley, engaging or disengaging the power.[152]

The belts at the Wall Street Mill were installed with a little slack, so that it would be easier to slip them on and off the pulleys. Since they needed to be tight to function properly, idlers (tighteners) were used to take up the slack. The tightener was a pulley mounted upon a frame which swung on a hinge. The pulley pressed on the slack side of the belt (opposite the pull side), which was usually the bottom.[153]

Belts which broke frequently were a major inconvenience to Oran Booth. He was required to lace the ends together with a strip of wet cowhide, which he always kept soaking in water in a can. The cowhide was easier to handle when wet, and when it dried it tightened up the lacing.[154]

Generator. When the Wall Street Mill opened, it did not have electricity. Later, Keys added a twelve-volt generator from a four-cylinder Dodge car to power electric lights. The machine, actually a combination starter-generator, was about 14" long and 7-8" in diameter, and was located under the ore bin. It was driven by a belt and a large pulley on the line shaft, which spun the generator at about 800 or 1000 rpm. The generator had been removed by 1966; its present location is not known.[155]

Water Well

Water is a vitally important resource in the desert. Its presence (or absence) controls the land use. The water at the Wall Street Mill had enabled the use of the site for stock watering and gold milling. As discussed earlier, the current well may not be the original, but it is certainly the well which provided water for the Wall Street Mill during its operation. Water was raised using a reciprocating pump, powered by a gasoline engine. The well and pump were an important part of the mill's technology and are considered historically significant; they are specifically included with the mill on the National Register of Historic Places.[156]

The well is approximately 32' deep. The well is primarily composed of unlined earth walls, only the upper 2-1/2' are lined with rock. It is covered with a wood frame superstructure; a boxed-in well-head cover was apparently added by monument personnel for safety reasons. An overhead pipe carried water to a storage tank near the bunkhouse kitchen and outside shower.[157]

The engine that is currently at the well is a three-horsepower Fairbanks-Morse model Z, 475 rpm gasoline engine. Its patents date from 1916 and 1917.[158] Keys probably had half-a-dozen

engines of this size at his ranch and properties, and the specific source of this particular one is unknown. However, it is at least the third engine that Keys used at the well. Prior to installing the model Z, Keys had used an engine that came from the ball mill across the wash. Another engine wasmust have been utilized by Keys at the Wall Street Mill before that time.

The amount of water in the well varied, and in dry years it did not produce enough water to operate the mill. In 1939 there was water standing at 15' from the bottom.[159] In 1966, the water level in the well was extremely low, but several thousand gallons were pumped up.[160] In dry years Keys hauled water in from either Barker Dam, the Desert Queen Ranch wells, or Quail Springs. He used a Maxwell truck with a 350-400 gallon tank on back to transport the water. When Willis was a youth he filled the tank from the cattle trough at Quail Springs, one bucket at a time.[161]

In the first years of the mill's operation, there was only one tank, used for reclaimed water; water from the well went straight into the mill process. Soon after the mill opened, Keys installed a second tank, just south of the older tank. Demmitt of Los Angeles manufactured this newer 1,500 gallon galvanized-iron tank. Keys acquired the tank from the ball mill across the wash. Well water was stored in this tank. This made the mill easier to operate, because the millman did not have to tend the well equipment at the same time the other machinery was operating.[162]

OTHER ELEMENTS ON SITE

Stones

A collection of stones remains across the wash to the east of the mill. A few are stacked in a short wall; it is possible that they originally came from Tulley's arrastra.[163] Two of the stones appear to be blank gravestones, and provide evidence of Keys' hobby of stone cutting and carving. He frequently worked on rocks, and samples of his work can be seen today at the mill and at the ranch, including corner markers for the mill site. He also carved the gravestones for his wife and children, who are buried at the ranch. Although Keys waged long battles with the Bureau of Land Management and Joshua Tree National Monument, his attitude seemed to soften in his old age, when he delighted in giving tours of the area. After Keys died in 1969, his friends in the Park Service moved one of the stones from the Wall Street site to his grave; Willis later carved and decorated that marker.[164] Keys' estate relinquished the mill to the National Park Service on September 24, 1971.[165]

ENDNOTES

1. U.S. Department of the Interior, National Park Service, "National Register of Historic Places: Inventory - Nomination Form: Wall Street Mill," by Gordon Chappell, 1975.

2. *California Mines and Minerals*, for the California Meeting of the American Institute of Mining Engineers (San Francisco: California Miners' Association, 1899), 396-98.

3. U.S. Department of the Interior, National Park Service, Alaska/Pacific Northwest/Western Team, *Historic Resource Study: A History of Land Use in Joshua Tree National Monument*, by Linda Greene (Denver: Denver Service Center, 1983), 91. Hereafter cited as Greene.

Descriptions of the Twentynine Palms Mining District often included the Pinon and Gold Park Districts. The Pinon Mining District was organized in 1892 by Al Tingman and Ed Holland (who owned the Pinyon Mine and Pinyon well), the German-American Company (which owned the Pleasant Valley Mine), and Garrison-Montegue Mining Company (owner of the Hexahedron Mine). Perkins Papers, Joshua Tree National Monument Museum, Twentynine Palms, California.

4. C. McK. Laizure, "Elementary Placer Mining in California and Notes on the Milling of Gold Ores," *California Journal of Mines and Geology* 30, no. 2-3 (April, July 1934): 122-23; Lou Jacobs, "Mining Notes," *Twentynine Palms Outpost*, 14 September 1933, 3; and California, Department of Natural Resources, Division of Mines, *Mineral Commodities of California*, Bulletin 176, "Gold," by William B. Clark, (Sacramento, 1957), 223.

5. Greene, 397; Lou Jacobs, "Mining Notes," *Twentynine Palms Outpost*, 27 October 1932, 5; and Willis Keys, interview by Reino Clark and Don Black, 7 March 1975, transcript, Joshua Tree National Monument Library, Twentynine Palms, California.

6. "Joshua Tree National Monument," *California Journal of Mines and Geology*, California Division of Mines, 32, no. 3, (July 1936): 382.

7. Greene, 395.

8. Greene, 395-96, citing S.E. Guthrey, Special Agent, Division of Investigations, Department of the Interior, to Director of Investigations, 6 May 1937, Central Files, 1907-49, Record Group 79, National Archives, pp. 8-10, 20-22.

9. Willis Keys, interview, 7 March 1975.

10. See issues of *Twentynine Palms Outpost*, 1932-34.

11. Greene, 38.

12. Ibid, 53; and Perkins Papers, Joshua Tree National Monument Museum, Twentynine Palms.

13. Oran A. Booth, interview by author, 2 August 1991, Twentynine Palms, tape recording, Joshua Tree National Monument Museum, Twentynine Palms.

14. "Milling methods," Perkins Papers. It is possible that George Meyers was on the site in the late 1880s, and dug the first well on the site. Willis Keys, interview by author, 6 August 1991, telephone from Twentynine Palms to North Fork, California, tape recording, Joshua Tree National Monument Museum, Twentynine Palms; Oran A. Booth, interview by Bill Truesdell and Lysa Wegman-French, 26 June 1991, Twentynine Palms, tape recording, Joshua Tree National Monument Museum, Twentynine Palms. Oral tradition usually places Tulley on the site in 1900. Booth, however, stated that he found Tulley's notice dated 1898. There are no claims filed for the site under the name Tulley in either San Bernardino or Riverside County.

15. Perkins Papers.
This mine reportedly was later named the Crown Prince. However, when William F. Keys claimed the Crown Prince, he said it had formerly been known as the Blunderbuss. San Bernardino County, Hall of Records, Mining Records, 14 January 1913, Book 37, 318.

16. Perkins Papers; and Gwen Keys, "A Brief Sketch of the Life of Wm. 'Bill' Keys," *Rockhounds Journal*, September 1962, 12, cited by Greene, 432.
In his youth, he had changed his name to Bill Key. He later added an "s" to his name.

17. Perkins Papers.

18. Perkins Papers.

19. Booth, interview, 26 June 1991.

20. Ibid.

21. Ibid; and San Bernardino County, Hall of Records, Mining Records, Book 204, 260-61.
The claim was supposed to be recorded with the county offices within thirty days after posting the notice, though it was not unusual for the recording to be later, or never at all. Mill sites could not be larger than five acres. Booth and McInnes claimed the site as a mill site on a placer claim, known as a first class mill site. This type was associated with a mine; the land only had to be used in some way (such as providing water) for the mine. A second class mill site was not associated with a mine, and it had to be used specifically for milling purposes. McInnes listed a Wall Street Mine as the associated mine, but that mine was never recorded with the county. Booth's name does not appear on the official papers. Emilio D. De Soto, and Arthur R. Morrison, *Mining Rights on the Public Domain*, 16th ed. (San Francisco: Bender-Moss Company, 1936), 293-96.

22. When a person filed a claim on a mill site (or mineral site) on federal lands, he did not buy the property. He only reserved permission to be the exclusive user of the site (or minerals). While miners had to renew their claim annually (through assessment work) mill men only had to show the intention of using the site. Once the claim was abandoned, another person could claim the site. For instance, Tulley's claim had expired when he left the site, so Booth and McInnes could claim the site. When Booth and McInnes left the site, the property ceased to be reserved for them. It was customary among miners to "give" the site to another person when the claim was abandoned. California, Department of Natural Resources, Division of Mines, *American Mining Law with Forms and Precedents*, by A. H. Ricketts, 3rd ed., Bulletin 98 (Sacramento: California State Printing Office, 1931), 453-56. Hereafter cited as Ricketts.

23. Art Kidwell, *Ambush: The Story of Bill Keys* (Fresno: Pioneer Publishing Company, 1979), 7; and Keys, "A Brief Sketch of the Life of Wm. 'Bill' Keys," 12, cited by Greene, 432.

24. Kidwell, 105.

25. See transcripts of oral history interviews in Joshua Tree National Monument Library.

26. Booth, 26 June 1991; and San Bernardino County, Hall of Records, Mining Records, Book 213, page 73.

27. Willis Keys, interview by author, 24 August 1991, telephone from Twentynine Palms to North Fork, California, tape recording, Joshua Tree National Monument Museum.

28. San Bernardino County, Hall of Records, Mining Records, 19 August 1930, Book 219, p. 244; 20 October 1930, Book 219, p. 322.

29. "Milling Methods," Perkins Papers; Willis Keys, interview by Reino Clark and Don Black, 7 March 1975, transcript, Joshua Tree National Monument Library, Twentynine Palms; Oran A. Booth, interview by author, 2 August 1991, tape recording, Joshua Tree National Monument Museum, Twentynine Palms; and Willis Keys, interview by author, 2 August 1991, telephone from Twentynine Palms to North Fork, California, tape recording, Joshua Tree National Monument Museum, Twentynine Palms.

30. Booth, 26 June 1991; and Willis Keys, 2 August 1991.

31. Crowley apparently was not a very enthusiastic worker, however, and it was observed that he "liked to watch someone else work." Booth, interview, 26 June 1991.

32. Willis Keys, interview, 2 August 1991.

33. Willis Keys, interview, 6 August 1991.

34. Willis Keys, interview, 6 August 1991; 13 August 1991.

35. Booth, interview, 26 June 1991; 24 August 1991.

36. Booth, interview, 26 June 1991.

37. Willis Keys, interview, 6 August 1991.

38. Ibid.

39. W. B. Tucker, and R.J. Sampson, "Mineral Resources of San Bernardino County," *California Journal of Mines and Geology* 39, no. 4 (October 1943): 428, 438.

40. Tom Patterson, "Joshua Tree Alters Tune About Former Adversary," *Riverside Press-Enterprise*, 4 February 1979, B-1.

41. Kidwell, 11, 130; and Greene, 71.

42. Kidwell, 105, 106.

43. Ibid, 179.

44. See Willis Keys, 6 August 1991; and U.S. Department of the Interior, National Park Service, Western Region Office, Historic Preservation Team, "Wall Street Mill, Joshua Tree National Monument: Preservation Study," by Gordon Chappell, Robert Cox and

Roger Kelly ([San Francisco], 1974?), for a more complete description of the structure.

45. Another old Lincoln on the site may have been one Bill Keys used for parts. Willis Keys, interview, 2 August 1991.

46. Willis Keys, interview, 6 August 1991.

47. Bill Keys, "Production Notes," written on wall of Wall Street Mill, transcript in Fact File, Joshua Tree National Monument, Twentynine Palms; and Bob Garry, interview by author, telephone, 29 August 1991. Wilburg's stepson, Bob Garry, married Keys' daughter Patricia.

48. U.S. Department of the Interior, National Park Service, Western Archeological Center, "County Nodes: An Anthropological Evaluation of William Keys' Desert Queen Ranch, Joshua Tree National Monument, California," by Patricia Parker Hickman, Publications in Anthropology, Number 7 (Tucson: Western Archeological Center, 1977) 62, 107; and Perkins Papers.

49. "Official Record: Daily Log Wall Street Mill, August - September 1966," Perkins Papers, Joshua Tree National Monument Museum, Twentynine Palms; and Perkins Papers.

50. "Official Record," Perkins Papers.

51. Ibid.

52. Albert L. Johnson, and Richard C. Innes, "Appraisal of Unpatented Mine and Millsite Claims, Estate of William R. [sic] Keys, Deceased, Probate No. 38872, San Bernardino County, California," for J.L. Cordary, National Park Service, 16 December 1969, p. I-2.

53. Gold also occurs in: 1) high-grade ores suitable for smelting, 2) non-amalgamating ores, 3) placer gold, and 4) complex ores. C. McK. Laizure, "Elementary Placer Mining in California and Notes on the Milling of Gold Ores," *California Journal of Mines and Geology* 30, no. 2-3 (April, July 1934): 263; and U.S. Department of Commerce, Bureau of Mines, *Gold Mining and Milling in the United States and Canada: Current Practices and Costs*, by Charles F. Jackson and John B. Knaebel, Bulletin 363 (Washington, D.C.: Government Printing Office, 1932), 90. Cited hereafter as Laizure, and Jackson.

54. Selecting a method of treating ore was determined by several characteristics besides the character of the ore, including the amount of capital, the availability of water, and the tonnage expected. Jackson, 91.

55. Otis E. Young, Jr., *Western Mining* (Norman: University of Oklahoma Press, 1970), 195; and Robert H. Richards, *Ore Dressing*, vol 1 (New York: Engineering and Mining Journal, 1903), 144.
There were also steam stamp mills, which forced the stamps down with steam pressure.

56. T. A. Rickard, *The Stamp Milling of Gold Ores* (New York: Engineering and Mining Journal, 1903), 35.

57. Richards, 1903 ed., 222.

58. Laizure, 265, 270.

59. Jackson, 107.

60. U.S. Department of the Interior, National Park Service, Alaska/Pacific Northwest/Western Team, *Historic Resource Study: A History of Land Use in Joshua Tree National Monument*, by Linda Greene (Denver: Denver Service Center, 1983), 395-6. Hereafter cited as Greene.

61. Young, 194.

62. Bill Keys, "Production Notes," written on wall of Wall Street Mill, transcript in Fact File, Joshua Tree National Monument, Twentynine Palms.
The average value of the ore milled in the monument was $18 per ton in 1937. Greene, 395-6, citing S.E. Guthrey, Special Agent, Division of Investigations, Department of the Interior, to Director of Investigations, 6 May 1937, Central Files, 1907-49, Record Group 79, National Archives, p. 9.

63. Willis Keys, interview by author, 6 August 1991, telephone from Twentynine Palms to North Fork, California, tape recording, Joshua Tree National Monument Museum, Twentynine Palms.

64. Oran A. Booth, interview by Bill Truesdell and Lysa Wegman-French, 26 June 1991; interview by author, 2 August 1991, Twentynine Palms, tape recording, Joshua Tree National Monument Museum, Twentynine Palms.

65. Booth, 26 June 1991.

66. Booth, 26 June 1991.

67. Perkins Papers, Joshua Tree National Monument Museum, Twentynine Palms, California.

68. To shorten his transportation route to this remote site, Keys built a road across a flat area, to the edge of a sheer drop off. This point, which today is called Keys View, was just above the mine. He used a string of mules to haul the ore up the steep embankment to the road and then loaded the ore onto a truck, which then went to the mill. Willis Keys, interview, 6 August 1991.

69. William F. Keys, "Custom Work," 1934-1937, Joshua Tree National Monument Museum, Twentynine Palms.

70. Keys, "Production Notes."

71. Oran A. Booth, interview by author, 2 August 1991, Twentynine Palms, tape recording, Joshua Tree National Monument Museum, Twentynine Palms.

72. Booth, 26 June 1991; Perkins Papers; and *Twentynine Palms Outpost*, 12 January 1933, 21 December 1933, 3 March 1934.

73. Willis Keys, interview, 6 August 1991; and Bill Keys, "Production Notes."

74. "Official Record: Daily Log Wall Street Mill, August - September 1966" Perkins Papers, Joshua Tree National Monument Museum, Twentynine Palms; and Perkins Papers.

75. Booth, interview, 26 June 1991.

76. Willis Keys, interview, 6 August 1991.

77. "Wall Street Millsite," Joshua Tree National Monument Administrative files, Twentynine Palms; and Keys, "Official Record."

78. Booth, interview, 2 August 1991; and Willis Keys, interview, 13 August 1991.

79. Willis Keys, interview, 6 August 1991.

80. Willis Keys, interview, 6 August 1991; Booth, interview, 26 June 1991.

81. Richards, 1903 ed., 207; and Theodore Simons, *Ore Dressing: Principles and Practices* (New York: McGraw-Hill Book Company, 1924), 211.

82. Dodge type jaw crushers are hinged on the bottom. Richards, 1903 ed., 33-34.

83. Perkins Papers; and Willis Keys, interview, 6 August 1991.

84. Willis Keys, interview, 6 August 1991.

85. They frequently advertised in trade publications; see, for example, *Los Angeles Mining Review*, 6 January 1906 and 12 July 1902, and the *Pacific Miner*, February 1909.

86. Willis Keys, interview, 6 August 1991.

87. Willis Keys, interview, 2 August 1991.

88. Booth, interview, 26 June 1991; and Greene, interview, 263.

89. There is some confusion concerning this location, because there are two Pushawalla Canyons. This mill site is southwest of Dillon Road, close to Thousand Palms Oasis. Keys installed steam stamps, which used steam to push down the stamps. Keys later learned that the site was on private property, but the owner allowed them to use it. Booth, interview, 26 June 1991, 2 August 1991; and Willis Keys, interview, 2 August 1991.

90. Booth, interview, 26 June 1991; Booth, interview, 2 August 1991; and Bob Michels, interview by author, 16 July 1991, Twentynine Palms, California.

91. Estimates have ranged all the way from ten to seventy tons. The Perkins Papers was the source of these two extreme numbers. In addition, Lennon estimated fifteen, then twenty, then forty tons during his visit. The volume of the bin is less than 84 cubic feet (a triangle with outside dimensions of 12' x 7' x 2'). At 100 pounds per cubic foot, this would hold, at the most, just over four tons of rock.

92. Willis Keys, interview by Reino Clark and Don Black, 7 March 1975, transcript, Joshua Tree National Monument Library, Twentynine Palms; and Willis Keys, interview, 2 August 1991.

93. "The Baker Iron Works," *The Rural Californian* XVI, no. 1 (January 1893): 38; and Greene, 185, 187.

94. Perkins Papers. In 1903 Richards estimated that the cost of a stamp battery, not including transportation, was $300 per stamp. This indicates that either the $3,000 figure is high, that the price included more than the stamps, or that the stamps cost about $2,400 to transport. Richards, 1903 ed., 205.

95. Greene, 351.

96. Ibid., 187.

97. Perkins Papers; Greene, 189, 199, 218, 244-46; Willis Keys, interview, 2 August 1991, 6 August 1991, 24 August 1991; and Booth, interview, 26 June 1991.

98. Richards, 1903 ed., 145; and Simons, 215.

99. Richards, 1903 ed., 145.

100. Young, 198.

101. Richards, 1903 ed., 181, 182.

102. Booth, 26 June 1991.

103. Richards, 1903 ed., 194.

104. Willis Keys, interview, 24 August 1991.

105. California, State Mining Bureau, *Thirteenth Report of the State Mineralogist* (Sacramento, 1896), 315, cited in Greene, 187; Willis Keys, interview, 6 August 1991; Booth, interview, 26 June 1991; and "Official Record."

106. Willis Keys, interview, 6 August 1991.
It was common for California stamps to drop at about ninety drops per minute; the stamps weighed at least 750 pounds and dropped about 4-6". In Colorado the stamps dropped slower, about thirty drops per minute, weighed about 500 pounds and dropped about 18". This difference was due to the character of the ores, with California ores being a simple ore that was free-milling, while Colorado ores were more complex. Rickard, 2.

107. Bob Lennon, interviewed by Reino Clark, 17 April 1975, tape recording, side B, Joshua Tree National Monument Museum, Twentynine Palms; and Richards, 1903 ed., 207.

108. Willis Keys, interview, 6 August 1991.

109. Willis Keys, interview, 7 March 1975; and Booth, interview, 2 August 1991.

110. Booth, interview, 26 June 1991.

111. Screens were also made of either punched plate with round holes and wire cloth.

112. Willis Keys, interview, 6 August 1991; and Perkins Papers.

113. Jackson, 105, 133.

114. Willis Keys, interview, 6 August 1991.

115. Lennon, interview, 17 April 1975.

116. Booth, interview, 26 June 1991.

117. Booth, interview, 2 August 1991; Willis Keys, interview, 6 August 1991.

118. Willis Keys, interview, 6 August 1991.

119. Greene, 395-6, citing S.E. Guthrey, Special Agent, Division of Investigations, Department of the Interior, to Director of Investigations, 6 May 1937, Central Files, 1907-49, Record Group 79, National Archives, p. 9.

120. John W. Meyer, interview by Reino Clark, 2 February 1976, transcript, Joshua Tree National Monument Library, Twentynine Palms, California.

121. William F. Keys, "Custom Work," 1934-1937, Joshua Tree National Monument Museum, Twentynine Palms.

122. "Official Record."

123. Booth, interview, 26 June 1991, 2 August 1991; Willis Keys, interview, 6 August 1991; and Richards, 1903 ed., 202-03.

124. Willis Keys, interview, 6 August 1991; and Booth, interview, 26 June 1991, 2 August 1991.

125. "Official Record."

126. "Official Record;" Willis Keys, 7 March 1975, 6 August 1991.

127. Other gravity concentration devices include corduroy blankets and vanners. Jackson, 109.

128. Arthur F. Taggart, "Seventy-five Years of Progress in Ore Dressing," in *Seventy-five Years of Progress in the Mineral Industry, 1871-1946*, ed. A. B. Parsons (New York: The American Institute of Mining and Metallurgical Engineers, 1947), 114; and Jackson, 108, 133-34.

129. Michels; "Official record;" and "Wall Street Millsite."

130. Willis Keys, interview, 2 August 1991.

131. Shaking tables were divided into two classes. The Wall Street table fitted the category of side-bump because the motion was at right angles to the flow of water. This table was classified further as having a riffled surface, as opposed to a plane surface. The Wilfley table was the most commonly known side jerk, riffled surface table. Richards, 1908 ed., 667, 670.

132. Simons, 163-64; Lennon, 17 April 1975; Jackson, 110; Young, 200; Richards, 1908 ed., 680.

133. Willis Keys, interview, 6 August 1991.

134. Perkins Papers.

135. Lou Jacobs, "Mining Notes," *Twentynine Palms Outpost*, 29 June 1933, 3, and 13 July 1933, 3; and Willis Keys, 24 August 1991.

136. Laizure, 264; and Jackson, 98.

137. Willis Keys, interview, 2 August 1991; Booth, interview, 2 August 1991.

138. Perkins Papers.

139. Willis Keys, interview, 2 August 1991; 6 August 1991.

140. Booth, interview, 2 August 1991; and Willis Keys, interview, 2 August 1991.

141. Large mining companies continue to use cyanidation today.

142. Greene, 261, citing Saunders interview, 27 February 1975, p. 3.

143. Meyer, interview, 2 February 1976.

144. Ibid.; and Keys, "Custom Work."

145. U.S. Department of the Interior, National Park Service, Western Region Office, Historic Preservation Team, "Wall Street Mill, Joshua Tree National Monument: Preservation Study," by Gordon Chappell, Robert Cox, and Roger Kelly ([San Francisco], [1974?]), 3; Cited hereafter as Chappell, "Official Record."

146. Lennon, interview, 17 April 1975.

147. Chappell, 3.

148. Willis Keys, interview, 6 August 1991.

149. *Pacific Miner*, July 1908, 39.

150. *American Mining Review*, 24 August 1907, 4.

151. Willis Keys, interview, 6 August 1991.

152. Willis Keys, [North Fork, California], to Lysa Wegman-French, Twentynine Palms, 13 August 1991, Joshua Tree National Monument Museum, Twentynine Palms.

153. Willis Keys, interview, 6 August 1991; and Richards, 1903 ed., 198.

154. Booth, interview, 26 June 1991, 2 August 1991.

155. Booth, interview, 2 August 1991; Willis Keys, interview, 6 August 1991; and "Official Record."

156. U.S. Department of the Interior, National Park Service, "National Register of Historic Places: Inventory - Nomination Form: Wall Street Mill," by Gordon Chappell, 1975.

157. U.S. Department of the Interior, National Park Service, "List of Classified Structures," form WASO-149 R (6/75), well at Wall Street Mill, page 8330-HS-2-B.

158. Fairbanks, Morse & Company began making gasoline engines in 1893, and became one of the world's largest manufacturers of engines. The Type Z series was introduced in 1915, and it became the company's most popular model. Its sales were so widespread that it forced smaller competitors out of business, and even the large International Harvester took notice. C.H. Wendel, *American Gasoline Engines Since 1872* (Sarasota, Florida: Crestline Publishing, 1983), 158, 159.

159. "Wall Street Millsite."

160. Perkins Papers.

161. Willis Keys, interview, 6 August 1991.

162. Booth, 2 August 1991; "Wall Street Millsite"; and Willis Keys, interview, 6 August 1991.

163. Willis Keys, interview, 2 August 1991.
Bill Keys built an arrastra on the east side of his ranch, near the location of the Desert Queen five-stamp mill (that is, not the one in his yard). He may have used stones from the Tulley arrastra for that structure. Greene, 216.

164. Kidwell, 184.
When a newspaper sensed the Monument's warming attitude towards Keys, it warned that "tradition seems to lionize a fellow who can be described as hard-working, picturesque, individualistic and anti-government. . . . Keys as a person does make an interesting study, but the National Park Service would do well not to make too big a hero of him." Tom Patterson, "Joshua Tree Alters Tune About Former Adversary," *Riverside Press-Enterprise*, 4 February 1979, B-2.

165. Greene, 218.

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BILL KEYS AND THE WALL STREET MILL

Two factors substantially improved this report. First, key people who had worked at, and cared about, the Wall Street Mill were available, and willing to be interviewed. Second, people have been interested in the mill for many years; I was able to utilize their earlier research.

Oral History Interviews and Correspondence

Oral history interviews and related correspondence provided myriad important and interesting details about the history, construction and operation of the mill. Willis Keys and Oran Booth were invaluable sources of information. Keys grew up with the mill as part of his childhood experiences; as he grew older he helped his father there and he eventually operated the mill as an adult. Booth claimed the mill site in 1928, then worked at Keys' mill, and remained his lifelong friend. He provided important details about the early years of operating the Wall Street Mill. I had several conversations with Bob Michels, who was associated with the Michels Mill; he was helpful because of his knowledge of milling technology and the history of the area. His conversations were not recorded for this project. All of the Keys and Booth interviews were recorded, and the copies were deposited in the Joshua Tree National Monument Museum, Twentynine Palms, California.

Keys, Willis. Interviews by author, 2 August 1991, 6 August 1991, 24 August 1991, telephone from Twentynine Palms to North Fork, California.

Keys, Willis, [North Fork, California], to Lysa Wegman-French, Twentynine Palms, 13 August 1991. Joshua Tree National Monument Museum, Twentynine Palms.

Booth, Oran A. Interview by Bill Truesdell and Lysa Wegman-French, 26 June 1991; interview by author, 2 August 1991; interview by author, 24 August 1991, telephone; Twentynine Palms, California.

Michels, Bob. Interview by author. 16 July 1991, Twentynine Palms, California.

Oral history interviews that were conducted earlier were also quite helpful. Both the Bill Keys and Willis Keys interviews discussed a wide variety of topics, with only a short time devoted to the mill. Bob Lennon was familiar with milling technology (though not the Wall Street Mill specifically); he gave a running commentary during an on-site visit to the site. John Meyer's interview provided unduplicated first-hand information about the cyaniding period at the Wall Street Mill.

Keys, Bill. Interview by Steve Smith, 13 October 1966, Willow Hole. Transcript. Joshua Tree National Monument Library, Twentynine Palms, California.

Keys, Willis. Interview by Reino Clark and Don Black, 7 March 1975. Transcript. Joshua Tree National Monument Library, Twentynine Palms, California.

Lennon, Bob. Interviewed by Reino Clark, 17 April 1975. Tape recording, side B. Joshua Tree National Monument Museum, Twentynine Palms, CA.

Meyer, John W. Interview by Reino Clark, 2 February 1976. Transcript. Joshua Tree National Monument Library, Twentynine Palms, California.

Manuscript and Photograph Collections

Perkins Papers. Joshua Tree National Monument Museum Twentynine Palms, California.
Michael Perkins gathered or created these clippings, photographs, handwritten notes, logs and manuscripts while he lived and worked at the Wall Street Mill and Desert Queen Ranch. The collection is especially valuable for its first-person information about the 1966 operation of the mill, including "Official Record: Daily Log Wall Street Mill, August - September 1966." Perkins wrote a short history of the site prior to the mill, apparently as told to him by Bill Keys.

"Wall Street Mill Photograph Collection." Joshua Tree National Monument Museum, Twentynine Palms, California.
Most were taken in the early 1970s by Park Service personnel. Also contains snapshots taken by Michael Perkins during the 1966 operation.

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Includes details about the site and its value.

Keys, Bill. "Production Notes." Written on wall of Wall Street Mill. Transcript in Fact File, Joshua Tree National Monument, Twentynine Palms, California.

Keys, William F. "Custom Work." 1934-1937. Joshua Tree National Monument Museum, Twentynine Palms, CA.
This single sheet appears to be an accounting page for the Wall Street Mill. It records sixteen mill runs and the leasing of the mill to the cyaniding company.

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The story of Keys' shooting of Worth Bagley, and his subsequent conviction, imprisonment, parole and pardon.

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This early newspaper/newsletter included a regular column on mining activities. Issues are available at the Twentynine Palms branch of the San Bernardino Public Library.

Patterson, Tom. "Joshua Tree Alters Tune About Former Adversary." *Riverside Press-Enterprise*, 4 February 1979, B-1.
Column warning the National Park Service not to romanticize Keys.

San Bernardino County, California. Mining Records. San Bernardino.

U.S. Department of the Interior. Bureau of Land Management. "Mineral Survey No. 6585 A and B, Los Angeles Land District: Field Notes of the Survey of the Mining Claim of Wm. F. Keys and F. M. Keys," and "Mineral Survey No. 6585 A & B, California, Claim of Wm. F. Keys & F. M. Keys," by John R. Botsford, mineral surveyor. 1955-56.
A legal description and survey map of the Wall Street Mill Site.

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Known as "The Bible" among Joshua Tree history devotees, this comprehensive document identifies historic resources connected with mining and cattle ranching, traces their backgrounds, and analyzes their historic significance.

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One-page forms which provide a photograph and brief information about each site's location, physical description, condition and recommended treatment.

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Places Keys in a network of interactions, and interprets his behavior in a context of social and economic change.

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Describes the social and economic history of the monument from Native American-European contact to the present.

U.S. Department of the Interior. National Park Service. Western Region Office. Historic Preservation Team. "Wall Street Mill, Joshua Tree National Monument: Preservation Study," by Gordon Chappell, Robert Cox and Roger Kelly. [San Francisco], [1974?].
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APPENDIX: ARCHAEOLOGICAL ASSESSMENT

In addition to documenting the standing structures and equipment, the 1991 HAER project at Joshua Tree National Monument also evaluated the archaeological resources at the Wall Street Gold Mill. Archaeological resources are defined as the physical remains of human activities and may include such things as artifacts, building foundations, privy pits, and food remains. The goals of the archaeological evaluation of the two sites included making an inventory of the archaeological remains, assessing the significance and the integrity of the remains, and making recommendations for the management of the remains.

Inventory Methods

An inventory of archaeological remains at the Wall Street Gold Mill was taken by walking over the ground surface of the two sites in linear transects at intervals of 10'. In addition, other sites in the immediate area that were visible or had been mentioned by informants were visited, although no effort was made to do a systematic pedestrian reconnaissance of the region. The recordation of archaeological remains included preparation of scaled maps and completion of State of California site survey forms; additional architectural drawings and photographs of the standing structures at the two sites were prepared by other members of the HAER team. The archaeological remains located by the survey were classified at five hierarchical levels: artifacts, features, feature-complexes, sites, and site-complexes.

Artifacts

Artifacts are "portable objects whose form has been modified wholly or partially from human activity."[1] Most of the artifacts in the inventory either are associated with features or are part of a general "background" scatter that help define the geographical boundaries of sites. Some, however, are isolated objects. Artifacts are important repositories of information about the age of the sites and the activities that have taken place there.

Features

In the most general way, features are non-portable artifacts.[2] The features have been grouped together into "feature types" on the basis of similarities in physical form, such as shape, size, or artifact content, or function, such as a building foundation or an inclined mine shaft. Feature types defined in the survey area include such things as artifact hot spots (localized concentrations of artifacts such as dumps or scatters), arrastras, footpaths, stamp and concentration mill buildings, ball mill pad, tailings pond, concrete machine anchor, inclined mine shaft, and building platforms.

Feature-Complexes and Feature-Systems

Feature-complexes are geographical clusters of features. The features in the clusters may be associated with different activities and time periods; however, features in the complex that are associated with the same contemporaneous activity are included in the same feature-system.[3] Most of the features recorded at the Pinto Wye Arrastra site, for example, are associated with the arrastra mill and, therefore, are part of the same feature-system. Other feature-systems in the inventory include such things as hoisting feature-systems associated with mine sites, stamp and concentration mill, ball mills, wells, and domestic households.

Sites

Sites are places or localities with features, artifacts, and other physical remains that are related to human activities that have occurred at that place. Site boundaries include the "context" of artifacts and features such as the soil matrix or physical medium within which they occur.[4]

Site-Complexes

Finally, sites are classified into "site-complexes," which Binford has defined as a geographical cluster of sites associated with activities or events that are "linked together as part of an overall strategy."[5] Several sites in the vicinity of the Pinto Wye Arrastra appear to be linked together as part of a strategy for gold mining and milling. Without question, the same type of site-complex may be associated with the Wall Street Gold Mill; however, only the Desert Queen Mine has been identified so far as part of the Wall Street complex.

ASSESSING SIGNIFICANCE

In addition to making an inventory, another goal was to assess the historical significance of the archaeological remains at the Wall Street Gold Mill. Following the standards and guidelines issued by the Secretary of the Interior, the remains are significant if they meet the "registration requirements" for listing on the National Register of Historic Places.[6] The registration requirements include eligibility under at least one of four significance criteria: integrity; significance at either the local, state, or national level; at least 50 years old; or of exceptional value if not meeting any of the other requirements.[7] The Wall Street Gold Mill already is listed on the National Register; however, the significance of the archaeological remains had not been evaluated within this context. Draft National Register Bulletin 36 identifies the circumstances under which the archaeological remains of historical sites may be eligible for listing on the National Register of Historic Places.

Significance Criteria

The archaeological remains must be important under at least one of four significance criteria (A-D) to be eligible for listing on the National Register.[8] Furthermore, the Secretary of Interior's Standards and Guidelines stipulate that the four criteria are to be applied within historic contexts. Historic contexts should be developed for this purpose.[9] The contexts identify the thematic, geographical, and chronological framework within which the significance evaluation takes place.

Criterion A. Under Criterion A, the site may be significant if the archaeological remains are needed to convey or illustrate or help interpret an historic property strongly associated with an important historical event or theme. What themes should be used are suggested by the thematic framework for American history developed by the National Park Service.[10] In the most general way the themes that are likely to be most appropriate for the Wall Street Mill include XII.A. Business: Extractive or Mining Industries; XVIII.F. Technology: Extraction and Conversion of Industrial Raw Materials; and XXX.J. American Ways of Life: Occupational and Economic Classes. Historic events and themes associated with "appropriate technology" gold mining in the American West during the Depression Era is the theme. The archaeological remains of historic properties strongly associated with events and themes may be eligible under Criterion A if they are needed to interpret the property.

Criterion B. Under Criterion B, the archaeological remains are significant if they are needed to convey or interpret an historic property that is strongly associated with the career of an important person. Most archaeological sites are not eligible under this criterion; however, the strong association between the Wall Street Gold Mill and William Keys, who played an important role in the local community, suggests that the archaeological remains at the mill may have some significance under Criterion B.

Criterion C. Under Criterion C, the archaeological remains are significant if they are needed to convey to the visitor or illustrate or interpret an historic property that is strongly associated with a distinctive engineering or architectural pattern or type or style. The South Dakota State Historic Preservation Center identifies several questions that are useful in evaluating mining sites under Criterion C.[11] The questions include (1) Is the technological pattern represented by the site/feature the "first of its kind?" (2) Does the site represent a major change in mining technology? (3) Is the technological pattern represented by the site/feature the "last of an era?" (4) Does the site/feature represent a new or experimental approach to mining technology? (5) Is the site/feature a reasonably well preserved example of a mining technology that is "typical" of a significant time period?

Criterion D. Finally, the archaeological remains are significant under Criterion D if they contain key information needed to answer important scholarly or scientific questions. Three steps are needed to assess the information content of archaeological remains: (1) develop a regional research design that identifies "important" research questions; (2) identify the archaeological "data requirements" of the questions; and (3) determine whether or not the archaeological remains being evaluated contain the critical data. No regional research design has been developed yet for the Joshua Tree National Monument; however, the research questions that are relevant to the Wall Street Gold Mill are most likely to be associated with mining technology, mining communities, and mining landscapes.[12] Some specific questions that might be used, for example, include variability and change in mining technology, the impact of mining technology upon workplace and community, the spatial organization of mining communities, and technological and social adaptation to the "High Desert" of the American West during the Depression Era.[13]

Levels of Significance

In addition to the four significance criteria, the National Register recognizes three geographical levels or scales at which they may be applied: local, state, and national. Accordingly, archaeological remains are considered to be eligible for listing

on the National Register if they are strongly associated with historical events, people, or architectural/engineering patterns that are considered to be important to the local community, the state, or the nation, or if they contain significant information that might be used to answer key scholarly or scientific questions about the local community, state, or nation. For determining National Register eligibility, archaeological remains are equally important at all three levels.

Integrity

In addition to eligibility under at one of the four significance criteria, the archaeological remains also must have retained enough integrity to convey their significance to the present. The National Register identifies seven elements of integrity: location, design, setting, materials, workmanship, feeling, and association (NRB 16). Draft National Register Bulletin 36 suggests using the concepts of visibility and focus to assess the extent to which historical archaeological sites have retained integrity. Visibility is the extent to which the physical remains of a historic property have survived and are observable today; focus is the degree to which the physical remains are readable or interpretable and can be linked to the historic property.[14] Under Criteria A-C, all of which require that archaeological remains be capable of conveying or illustrating historic properties, both good visibility and focus are needed; however, eligibility under Criterion D requires only good focus.

Age

The National Register also requires that archaeological remains be at least 50 years old to be eligible for listing; however, younger sites may be eligible under the "exceptional" rule if they are especially important. In addition to the age rule, the archaeological remains must be associated with the time period that has been determined to be significant. Since the Depression Era appears to be the period of significance for most mining sites in the Joshua Tree National Monument, older or younger sites may not be significant.

INVENTORY OF THE WALL STREET GOLD MILL

The Wall Street Gold Mill is situated in San Bernardino County and is listed on the National Register of Historic Places. Associated with the mill are standing buildings, milling machines and other equipment, and archaeological features. Together, the features are integrated into several feature-systems that reflect the history of gold milling and other activities taking place at the mill. The mill itself was part of a larger site-complex that included the Desert Queen Ranch, the Desert Queen Mine, the Hidden Gold Mine, and several other mines that supplied ore to be custom-worked at the mill on an irregular schedule. None of the other sites, however, are included in this archaeological inventory and evaluation. The physical remains of the Wall Street Gold Mill are scattered in several geographical clusters. Both standing buildings and archaeological features are included.

Ten feature-systems and 34 features were defined. The feature-systems include a stamp and concentration mill with several intact pieces of machinery, a cyanide treatment system, a ball mill, a mill workshop, a well and pump system, a domestic household organized around a bunkhouse, a grave stone workshop, a transportation network, and the archaeological remains of a 1967 party that may be reflected in a beer bottle dump and several isolated artifacts.

The Stamp and Concentration Mill

Both architectural and archaeological features reflect the activities of a stamp and concentration mill that operated during the 1930s. The most visible physical image of the mill is a standing building (Feature 1) with associated stamp mill, Meyer amalgamation table, engine house, and water storage tanks. Feature 2 is a low density trash scatter of tin cans, glass bottles, corrugated metal sheets, and unidentified metal fragments just outside the mill building. Feature 3 is a barbed wire fence around the mill.

Water Reclamation System

One of the more interesting features of the Wall Street Mill is a water reclamation system associated with the processing of tailings. After leaving the concentration table, tailings and water flowed down a metal trough eastward for about 20' and into a U-shaped ditch. The ditch continued eastward for about 40'and

then turned back toward the mill, terminating in a sump pond about 20 ' from the engine room. Tailings settled out into the bottom of the ditch and were hand-shoveling into the little gulch at the east end of the mill, building up into a high tailings pile that had to be leveled periodically. The water continued into the sump pond, where it accumulated and was pumped through a small pipeline to the storage tanks above the mill for reuse. Archaeological remains of the system are sparse. Feature 4 is a tailings pile at what may be the site of a tailings pond next to the stamp mill building. Feature 5 is the barely visible scattered remnants of the water reclamation trough.

Cyanide Leaching System

In late 1935, a 12-ton cyanide leaching tank was set up in the dry wash northeast of the Wall Street Mill by John Meyer and Charles Phelps. The system included the agitation tank, a precipitation box, and a tailings flow down the wash. Archaeologically, however, the system is nearly invisible. Not only is it unclear where the tank was set up, but the tailings flow from the operation has been dispersed by the stream and is no longer visible.

Ball Mill

The site of a rotary ball mill is situated about 230' southeast of the Stamp and Concentration Mill at the intersection of the main wash running approximately north-south and a smaller wash running approximately southeast-northwest. Oral history suggests that the mill was erected in the early 1930s, together with a Myer's concentration table, and processed ore from the D-C (Elton) Mine until 1933. At this time, the table and the ball mill was moved to the Stamp and Concentration Mill by William Keys, but the ball mill was sold shortly thereafter. Three archaeological features appear to define the ball mill location. Feature 6 is the concrete foundation upon which the mill was mounted. The foundation is approximately 10 ' by 7 '. Feature 7 is a small mill tailings dump. Feature 8 is a platform made of galvanized metal and wood upon which tailings appear to have been placed.

Original Mill

What appears to be the place where the original mill building stood was located just across the big wash from the ball mill site. Covering an area approximately 40' x 30', the site is marked by a low density background scatter of artifacts and features. Four archaeological features have been defined. Feature 9 is the excavated/cutout and leveled terrace upon which a building or structure probably once stood. Feature 10 is a rock and earth pile just above the excavated foundation. Feature 11 is a concrete machine pier with 4 anchor bolts. Feature 12 is a hard rubber mold scatter associated with a linear rock alignment about 15' southeast of the concrete pier. In addition to the 4 features, several artifacts were scattered over the surface, including screen fragments, a small diameter iron pipe, and a galvanized metal and wood trough.

Well and Pump System

Just east of the stamp and concentration mill is a well and pump feature-system. Four features were identified. Feature 13 is a partially rock-lined well about 32' deep and covered with a wooden frame structure. Feature 14 is an associated pump and engine. The 3-horsepower Fairbanks-Morse engine was patented in 1916 and 1917. Feature 15 is a water pipeline extending from the well to the water storage tanks above the stamp and concentration mill. Feature 16 is another water pipeline extending from the well to the bunkhouse foundation; water was pumped into a storage tank that supplied the kitchen and an outdoor shower.

Domestic Household

Several archaeological features at the site of the Wall Street Gold Mill are not associated with milling technology but appear to have been the physical remains of a domestic household. Twelve archaeological features have been defined as part of a household feature-system. The features include a bunkhouse, outhouse, and trash disposal areas. Feature 17 is the excavated/cutout and leveled terrace upon which the bunkhouse building once stood. The feature includes a rock retaining wall between the well and the leveled terrace. Feature 18 is a water pipeline that appears to have been connected to Feature 16 of the well feature-system and that supplied water to the bunkhouse. Several other pipeline fragments are scattered over this area. Feature 19 is a wooden table at the south edge of the terrace. Feature 20 is a window glass fragment scatter at the north edge of the bunkhouse terrace. Feature 21 is another leveled terrace situated at the northern edge and above the bunkhouse terrace. On this terrace,

which may have been the foundation for another building, are features 22-24. Feature 22 is a rock pile next to the metal funnel or smokestack designated as Feature 23, and Feature 24 is a scatter of lumber, window glass, and wire screen just east of the funnel/smokestack. Finally, Feature 25 is a scatter of crown bottle caps, glass beer bottle fragments, and light green glass bottle fragments on the terrace above the bunkhouse and at the same level as the mill input.

Several other features that appear to be associated with the residential settlement were located just across the big wash from the bunkhouse complex. Feature 26 is a collapsed wooden frame building across the big wash from the bunkhouse site that probably was used as an outhouse. Feature 27 is a low density scatter of tin cans and glass bottle fragments about 50' east of the outhouse that suggests a refuse disposal area. Feature 28 is a wood and chicken wire framework probably used as some kind of enclosure.

Grave Stone Workshop

Just south of the outhouse are the archaeological remains of what appears to have been a "cottage industry" in making grave stones (Feature 29).

Transportation System

A network of roads and automobile parts are associated with transportation activities. Four features were identified. Feature 30 is a road network. Feature 31 is the body of a 1929 Lincoln modified into a pickup next to the beer bottle dump. Feature 32 is an unidentified automobile body next to the bunkhouse. Feature 33 is another unidentified automobile body next to the ball mill and across the big wash from the mill workshop.

Beer Brewing Operation

The final feature-system to be identified at the site probably is associated with Willis Keys' home brewing activities in the 1940s but may have been the trash from a several day party, which, according to oral history interviews, was held at the site in 1967. Feature 34 is a small dump of "not to be refilled/no deposit/no return" glass beer bottles. Non-returnable beer bottles were available after 1938.[15] Some of the bottle caps and beer bottle fragments in what has been identified as Feature 11 in the Domestic Household feature-system also may be associated with the home brewing activities or the party.

CHRONOLOGY

Artifact time makers were sparse. The two maker's marks located on glass bottle fragments in the bunkhouse features fit easily into the chronology of the documentary/oral history model: (1) a mark used between 1939 and 1957 by the Latchford-Marble Glass Company in Los Angeles, California; and (2) a mark used since 1945 by the Glass Containers, Inc., company of Los Angeles, California, and other places.[16] The beer cans observed at the site are flat top and opened with "church keys;" these cans were first marketed in 1935 and pretty much replaced by soft-top cans by the early 1960s.[17]

SIGNIFICANCE

The archaeological remains at the site contribute to the significance of the standing mill and machinery under criteria A and C. Under Criterion A, the archaeological remains at the Wall Street Gold Mill helps convey and illustrate a property type strongly associated with small-scale gold milling and business practices in the Joshua Tree region during the Depression Era. Under Criterion B, the mill is strongly associated with the career of William Keys, a figure who was prominent in the local community between the 1920s and the 1950s. The archaeological remains, however, probably do not contribute to the association. Under Criterion C, the architectural and engineering remains at the site provide an excellent example of a small-scale stamp and concentration mill; although not highly visible, the associated archaeological features probably help interpret the technological pattern and thus contribute to the site's significance under Criterion C. The information content of the archaeological features do not appear to be sufficient to contribute to significance under Criterion D.

INTEGRITY

Visibility and focus are the two key measures of archaeological integrity. Without question, the standing stamp and concentration mill has high visibility and focus; however, the archaeological remains scattered over the rest of the site generally have low visibility and poor focus. The archaeological record of the

cyanide leaching system, for example, is nearly invisible and poorly focused, in part because of dispersion of the tailings down the dry wash.

Some years ago the bunkhouse and associated buildings were either torn down or have collapsed, and the archaeological remains have low visibility; however, the remains are still focused enough to work out the spatial geography of domestic activities. The archaeological remains of the mill workshop, the ball mill, and transportation network are reasonably focused but not very visible. Finally, the grave stone workshop and the well and pump system are still quite visible and focused.

MANAGEMENT RECOMMENDATIONS

In addition to making an inventory of archaeological remains and evaluating their significance, the purpose of the 1991 Joshua Tree project was to make recommendations for preservation planning. The Secretary of Interior's Standards (1983) stipulates that preservation planning involves the development of "goals and priorities for the identification, evaluation, registration, and treatment of historic properties" (Standard for Preservation Planning II). The key goals for the management of the Wall Street Gold Mill are (1) the development of an interpretative plan for the property, and (2) the development of multiple property documents to more fully place the property within an historic context.

The Development of an Interpretative Plan

Perhaps the most immediate preservation goal should be the development of an interpretative plan that could incorporate the two sites. One approach is to treat the Wall Street Gold Mill and other historic mining properties in the Monument as parts of a collection to be used in developing exhibits in an outdoor museum of technology and industry.[18] The boundaries of such outdoor museums are defined by the mining landscape. Collections in the museum are made up of mine waste rock dumps, mill tailings, standing buildings and structures, archaeological sites, road networks, and the like. Exhibits are organized around the collections by using labels and interpretative graphics, organizing traffic flow, and other museum methods to interpret the history of mining technology and society. Thus, the Wall Street Gold Mill could play a role as an exhibit in an outdoor museum of technology and industry. In a most general way, for example, the mill is an example of an "appropriate technology"

adaptation to the Mojave Desert during the Depression Era. Whether or not the Depression Era adaptation is significantly different from adaptations during the late nineteenth and early twentieth century is a research question with no answer as yet.

The Preparation of Multiple Property Nominations

Another preservation goal is the preparation of more complete historic contexts for the two sites. The Wall Street Gold Mill is an example of an historic property type that might be best managed within the multiple property approach. Within this approach, historic contexts are developed for a single property type such as small-scale stamp and concentration mills that are expected to have a number of examples. Registration requirements for the property type are defined in the multiple property document; acceptance of the document by the SHPO and the Keeper of the Register implies that the same requirements can be used to evaluate each example of the property whenever they are located. Furthermore, the multiple property document does not place properties on the National Register; rather, it provides a standard historic context and registration requirements for evaluating all examples of the same property type that may be used in developing nominations to the National Register.

ENDNOTES (APPENDIX)

1. Sharer and Ashmore (1987) p.65

2. Sharer and Ashmore (1987) p.66.

3. Hardesty (1988)

4. Sharer and Ashmore (1987) p.77-80

5. Binford (1983) p.117

6. U.S. Department of the Interior (1983) p.36 CFR 60.4; *National Register Bulletin* 16

7. 36 *CFR* 60.4

8. 36 *CFR* 60; 36 *CFR* 63; National Register Bulletin 15

9. U.S. Department of the Interior (1983)

10. U.S. Department of the Interior (1987)

11. South Dakota State Historic Preservation Center (1985) p.10-12

12. Hardesty (1988)

13. Hickman (1977)

14. Deetz (1977) p.94-95

15. Holsher (1965) Table II

16. Toulouse (1971) p.332; p.220

17. Busch (1981) p.100-101

18. Hardesty (1990)

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ADDENDUM TO:
WALL STREET GOLD MILL
Joshua Tree National Park
Twentynine Palms vicinity
San Bernardino County
California

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